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Vol. VI. NEW YORK, SEPT. 12, 1885. No. 11.

THE underground wire commission of this city continues to hold its sessions and listens to scores of plans to mitigate the alleged evil. Meanwhile the Broadway railway tunnel project is being actively pushed and its completion will, it is said, solve the wire question so far as Broadway is concerned. The commission will give hearings for some time yet, and speculation is already rife as to their subsequent action.

OUR very full report of the telephone convention will be found exceedingly valuable reading, even for those not directly interested in telephony. The papers and discussions took a wide range, many of the subjects considered being as applicable to telegraphy and electric lighting as to telephony. Our readers will therefore, we believe, appreciate our enterprise in giving them so prompt and full a report, even at the expense of crowding out of this issue some of the usual articles on general electrical subjects.

IT is greatly to be regretted that the electric railroad which had been projected in Fairmount Park, Philadelphia, should have been abandoned. Under the circumstances, however, there seemed to be no other alternative, as even an electric railway can not be run with a dead loss staring it in the face. The Philadelphia Park Commissioners ought to remove the onerous burdens plaiced upon the railway company and permit it to bring the road to a finish. It is encouraging to learn, however, that arrangements have been made for a trial in another part of the city.

THE distribution of electricity seems to be calling into life new devices in rapid succession. A favorite idea now being worked at by many is that of employing "transformers" or, generally speaking, secondary coils, which are specially constructed for the purpose. We have already described the Gaulard and Gibbs system of distribution by secondary generators and the results obtained at the Turin Exhibition were very satisfactory. It would seem that their value being established, their general introduction ought not to be long delayed, and our enterprising electricians might do well to direct their attention to the subject, looking to its development in this country.

APROPOS of the recent electric light tests in Philadelphia, it is stated that some of the incandescent lamps in the Theatre Royal, Manchester, have been in constant use for over two and a half years, which gives a life of over 5,000 hours. At Temesvar, in Hungary, similar lamps have lasted nearly 3,000 hours before burning out, and the majority are still in use. It would seem, therefore, that the Franklin Institute's test was hardly long enough, and that actual experience may well be taken as a guide in the matter. The tests at Philadelphia were nevertheless of special value in determining the other qualities of the lamps, and for the reason that the conditions were kept constant throughout.

THE equipment of the New York Elevated Railway on the Daft system has roused the projectors of new elevated roads to equip them at once on the electric system. As our Boston correspondent writes, the promoters of a similar railway in that city have made arrangements with the Daft Company for the introduction of its motors. We shall watch the undertaking with interest, as it presents the first case of an elevated road initially equipped with electric motive power. We may add here that we have seen the report of a disinterested party who went to Baltimore in order to personally investigate the Daft railway recently completed there. The report is a flattering testimonial to the success of the road, and states that the railroad company feel well paid for the unavoidably long delay in the equipment.

IN another column will be found an interesting account, by Mr. Jenks, Manager of the Incandescent Department of the American Electric Manufacturing Company, of the methods pursued in the introduction of the "municipal system" of electric lighting. The promoters of this scheme have entered upon a course which, we have no doubt, will be found to be not only a wise but a very profitable one. This combination of arc and incandescent street lighting seems at once to do away with the objections which have been raised against either when used singly. Running incandescent lamps in series has been attempted before, using larger lamps and with good success, and the advantages of a reduction of wire, attendance, etc., will no doubt materially aid in the economical operation of the system. A beginning has already been made in several New England towns, and report has it that others will be asked to adopt the system, to the exclusion of gas and oil..

THE delegates to the Berlin Telegraph Conference passed several resolutions which will affect the present European rates to a considerable extent. The general effect of these changes will be to reduce the present cost of European telegrams (apart, that is to say, from those between conterminous countries) by about 40 per cent., and it is calculated that the greater proportion of this falling off will probably have to be borne by the private companies, though it would be premature to make an estimate on this head until the details of the proposed innovation are settled. In addition to the above, it is very probable that the cost of European messages to India, China, Japan and Australia will be very considerably lowered. These reduced rates will no doubt give a stimulus to cable traffic which will increase the business so as to more than balance the reduced income.

ONE of the most important subjects debated at the Telephone Commission this week was that of a uniform wire gauge. It will be observed that after a lively and intelligent discussion of the matter in its different bearings, the new English standard gauge was adopted. This course will probably have the assent and commendation of many who are outside telephonic circles, and will yield beneficial results. The gauge adopted should, indeed, be called European rather than English, as it has received the sanction of the governments of England, France and Germany, the three countries that consume most wire on the other side of the Atlantic; and now that there is a tendency to adopt it here, the gauge might well be called "International." Most of these attempts to obtain uniformity are good, and now that the telephonists have led the way in the electrical field, the telegraphists and the electric light men will exhibit a truly scientific spirit in following the example. The Convention acted wisely, we think, in refusing to confer with other electrical societies on this matter. It was needful that the ice should be broken, and the Convention therefore plunged in boldly, with the feeling that if it was doing a sensible thing, other bodies would lose no time in taking similar action. What will the Electric Light Association do in the matter. Cannot the American Institute of Electrical Engineers render assistance in obtaining uniformity of gauge for wires used in all branches of electricity?

THE action of the National Improved Telephone Company in invoking the aid of the government in its fight against the Bell Company will, no doubt, be a surprise to many. The suit now becomes one of The United States *vs.* The Bell Telephone Company, and its trial will take place in the U. S. Circuit Court at Memphis. As our readers will have inferred from Mr. Van Benthuysen's communication, which appeared in our issue of August 8, the stand taken by the National Improved Company is that Bell was not the original inventor of the telephone. While the method of procedure is a rare one, it nevertheless brings with it the guarantee of a hearing for the National Improved Company, which apparently was denied at Pittsburgh recently. Mr. Van Benthuysen and his colleagues are evidently determined to bring the question to an issue, and perhaps the sooner this is accomplished the better for all concerned. This endless telephone litigation not only retards the business as a whole, but puts a check upon inventive genius in the field of telephony, which has by no means reached its full development. It will be noticed from our report of the telephone convention, in another column, that Mr. Lockwood refers to the litigation against the Bell Company, and asserts, in his own dogmatic way, that the company never felt more secure regarding its patents than it does at the present time. Mr. Lockwood also added that the Dolbear case—in which a claim similar to that of the Improved Company is made; namely, that Reis, and not Bell, invented the telephone—is to come up on an appeal before the United States Supreme Court next spring.

The United States vs. the Bell Telephone Company.

We are in receipt of the following telegram:

WAUKESHA, Wis., Sept. 8, 1885.

To the Editor of The Electrical World:

SIR: On the petition of Charles P. Huntington, of Mississippi, J. R. Beckwith and myself, of New Orleans, George Gantt and others, of Memphis, and the presentation of overwhelming evidence that Bell did not discover the art of transmitting speech by electricity or invent the telephone, the United States District Attorney at Memphis submitted the evidence to the Department of Justice and applied for and received permission to institute suit in the name of the Government to recall or repeal both of the Bell telephone patents, Messrs. J. R. Beckwith, George Gantt, Luke Wright and Casey Young being appointed special Government attorneys to assist in prosecuting said suit. This will undoubtedly end the greatest imposition ever put upon this country. Bill of complaint will be filed to-morrow. As we own the original intermittent and other fundamental patents, the public will have through u immediate and active competition at reduced rates.

W. VAN BENTHUYSEN,
President National Improved Telephone Company of New Orleans.

It is probably not generally known that the United States Government will prosecute a suit for the repeal of a patent. No one has the right to compel the United States to file a bill of complaint for this purpose in its own name, and it only does so when evidence has been presented showing fraud or mistake in the issue of a patent. The mode of procedure is for the District Attorney to file an application for permission to bring the suit. Having furnished an outline of the case, presented satisfactory evidence—necessarily of an *ex parte* character—and obtained th permission of the Department of Justice, the bill of complaint in the name of the Government can be filed at once or at any time during the life of the patent, upon order of the complainant, in the Circuit Court of the district.

According to the above telegram the bill of complaint was to have been filed at Memphis on Wednesday, Sept. 9. If this was done, the case will take its ordinary course, and with the proverbial law's delays it will probably be a long time before any decision regarding it will be reached. The substance of Mr. Van Benthuysen's dispatch was telegraphed to the representatives of THE ELECTRICAL WORLD at the telephone convention, and shown to officers of the Bell Company, and to a number of prominent delegates. They were all greatly interested, but affected to treat th matter with wonderment and contempt, and "guessed the company could stand it."

It is a very rare thing for a patent to be declared void by reason of its having been obtained by fraud or mistake, although it is not uncommon to file bills of complaint in the name of the Government, and to bring evidence with a view to proving fraud or mistake. The case of the United States *vs.* Gunning (18 Fed. Rep., 511), and Same *vs.* Same (22 Fed. Rep., 653) is the only one we know of in which the patent was repealed. In this instance, it was proved that the patentee made oath that he was the original inventor, and that the invention had not been in public use over two years; whereas the evidence showed that the contrary was the case. The decision, therefore, seems to have been just and equitable, especially when it is remembered that the government has jurisdiction to repeal grants for land when issued by fraud or mistake. We would also refer those interested to two other cases of a similar nature, namely, Mowery *vs.* Whitney (14 Wallace, 440, 1871), and United States *vs.* Stone (2 Wallace, 535, 1864).

Irish's Telephonic Apparatus.

The peculiarity of this system is that the transmitter and receiver are identical in their action, and interchangeable, just as are Bell's instruments; but here the similarity ends. In Bell's apparatus the diaphragm or tympan, capable of inductive action, is held down all round its edges and vibrates in the manner of a drumhead; but the inductive plate in the telephone constructed by Mr. Irish is free at its edge and firmly held in the centre. In the illustration, *C* is a wooden case with an earpiece or mouthpiece *M*, screwed therein. *N S* are the poles of a horseshoe magnet, between which is a block of wood *B*. The fine wire *W* is not wound around each pole separately, as is usually the case, but is wrapped around both poles so as to form but a single coil. The plate *D*, of ferrotype metal, free all round its edge, is screwed to the wooden block *B*, by a small screw which passes through a small brass collar *b*, and India rubber rings *i*.

The transmitter, which we do not consider it necessary to illustrate, is inclosed in the usual wooden case, to which is attached the ordinary switch, bell push, etc. The magnet is somewhat larger than that in the receiver and is laid flat in the back of the case, the two coils, wound separately and joined up in series, projecting from the faces of the poles and not from the ends.

The diaphragm is also of greater diameter than that of the receiver, their respective sizes being 3¼ inches and 2 inches.

The talking of the instrument, says the London *Electrical Review*, was very articulate, but not loud, this latter quality being scarcely to be looked for in the form of apparatus employed.

Municipal Electric Lighting.

BY W. J. JENKS.

The first chapters of the history of electric lighting are very naturally devoted almost entirely to the arc system. The earliest substantial progress in the use of the type of apparatus now commercially valuable, suggested, at about the time of the Centennial, the exhibition of large lamps at conspicuous points where the great intensity of their light would find a field commensurate with their illuminating power. Hence the summit of the Western Union building in New York, and the space between the Main Building and Machinery Hall at Philadelphia, were chosen for the first really public exhibitions in this country. With the advent of the Brush dynamo and lamps the attention of experimenters turned to the regulation street posts, so short as to be practically worthless, and then sprang to the other extreme of towers so lofty as to waste their energy in a vain attempt to illuminate an entire city from a single center.

The experience of to-day points to the availability of towers of moderate height for large open areas; of tall masts, say 40 to 50 feet, at prominent corners or between high buildings, over of reasonably clear streets; and as most efficient of all, lamps suspended from 35 to 50 feet above the pavements between diagonally opposite corners at street intersections. Here the arc lamp finds its best field, the great intensity of its rays, when lifted well above the line of sight and supplied from a good number of points of moderate illuminating power, effecting a very satisfactory distribution at a reasonably economical figure. No cast-iron rule can be laid down by one town or city as an ultimatum for the guidance of others. The tower system, which gives satisfaction in the growing cities of the prairies, with their wide streets clear of shade trees, and low buildings, would inevitably fail in New York or Boston. The suspension of the most powerful lamps on the tops of 50-foot poles in the City of Elms would, during more than half the year, simply light the foliage of the tree-tops, and show as moonlight, very much clouded, on the walks and drives below. The electric light company using the American Company's system, and whose success in Worcester, Mass., has been so marked, is now preparing to change, at considerable expense, about fifty lamps from the poles where they have thus far been located, to positions over the middle of the streets on substantial and permanent truss supports, beneath the pendant branches, where their light will be doubly efficient.

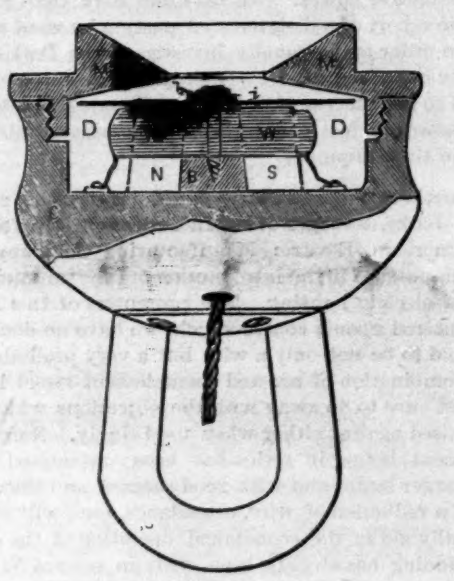
But even under these circumstances it is not economical to accomplish the thorough lighting of streets. A broad view of the subject does not bound its field by the large areas and wide avenues of the prominent business and residence districts. Mr. Edison once said, "What I set out to do was to supply a light which would displace gas wherever that could be successfully used." The results of this aim and policy are now shown, not only in the ease with which lamps of 10, 16, 32, 50 or 100 candle-power may be connected with an Edison central station system for general incandescent lighting, at any point within the territory covered by its conductors, but more prominently, as well as more economically, by the "Municipal System," which, having been successfully tested at Lockport, N. Y., is now being introduced for commercial service at other places. In brief, its features comprise an Edison dynamo wound for a uniform E. M. F. of say 1,000 volts, and a current of from 12 to 150 ampères, in different machines, according to capacity required; a special lamp of low resistance, and an automatic cut-out to complete the circuit on the breaking of the carbon filament.

The smallest dynamo yet estimated on will maintain four circuits, in multiple with the field and with each other, each circuit carrying incandescent lamps in series, the aggregate resistance of each circuit being from 250 to 350 ohms, according to the ampère capacity adopted. The per cent. of energy lost in the conductor should, of course, be calculated to determine the number of lamps to be included.

For instance, if we assume a 10 per cent. loss in each circuit, 100 out of the 1,000 volts will be absorbed in the wire, and the remaining 900 volts will work through 300 ohms in the lamps and maintain a current of 3 ampères. As the cross-section of the carbons is the same in all sizes of lamps, their resistance and consequent candle-power will vary with their length, and it becomes possible to distribute small lights over the area covered by a given circuit, exactly as required, the only limitation being the sizes of lamps found to be commercially economical. For example, a single circuit may be made to operate 45 to 55 10-candle, or 35 to 40 16-candle, or 17 to 20 32-candle, or 10 to 12 50-candle, or 25 10s, 10 16s and 3 50s, or 20 16s and 10 32s; in fact, any combination within the limit of its voltpower.

Of course, the distribution can be effected as economically as that of the arc light, and the size of the wire may be much smaller, a No. 12 B. W. G. sufficing for a circuit 7 or 8 miles in length with a loss of only 10 per cent., and a single wire running up one street and down another will require only short, light poles. The largest dynamos thus far estimated on will yield about 150 ampères, or 35 to 50 circuits, according to the current adopted in any particular instance. With a reasonably large carbon, a corresponding current and as low an E. M. F. as is consistent with economic transmission, the maximum life of the lamp will, of course, be attained. While the test of time has not in any great number of instances been applied to this system, the results thus far indicate a very long duration, and but a slight tendency to blacken during service.

The hoods adapted to this system are of special and very



IRISH'S TELEPHONIC RECEIVER.

neat design, excluding all falling moisture, and may be furnished with either one or two sockets. In the first arrangement the failure of the lamp carbon instantly operates an automatic cut-out, completing a shunt circuit around the lamp, as in the improved arc systems. In the other a second lamp is switched in, and a mark on the hood will show to the police or patrol that the spare lamp is burning, and thus call attention to the necessity of replacing the exhausted one. The first plan has the advantage of indicating immediately at the station a change of the resistance in the particular circuit affected. The hoods may be adapted to any existing posts, or suspended from brackets on trees, or from guys across the street.

The great flexibility of this system is evident even from this hasty glance. Its wires, run from the same station as the arc system, often on the same poles, may also reach to as great distances, and the advantage of alternating a number of small lights, well distributed, with the more powerful arcs through densely shaded neighborhoods, in narrow streets, courts and alleys, at a great saving of power, needs only to be mentioned to be appreciated by the practical electric light manager, whose ambition to drive every gas post and naphtha or kerosene lamp from the streets has never thus far seemed likely of immediate gratification. There are in every city large suburban districts not requiring the intense brilliancy of the arc, which may now be economically supplied by 16-candle incandescent lamps at the rate of seven or eight to the horse-power, or by 10-candle lamps, twelve of which are supplied by the same energy.

It is by the aid of this system that the streets of Lawrence are to be supplied with 450 lights, the contract being taken by the local Edison Company. Where, as in all large cities, some all-night work is done, the "Municipal" can be operated with an insignificant additional outlay for coal, oil and wear, with practically nothing for attendance. As all the lamps of the largest city may by this system be lighted or extinguished at the same instant, the expensive method of accomplishing this heretofore necessary, which has increased the cost of gas or other systems, will now be abolished, and no district be left unprovided for during the early evening hours from a failure of the "lighter" to cover his route. The important item of breakage of lanterns is also left out of the estimate, as there is no exposed glass but the small bulb of the lamp. This fact also increases the practical yield of light from a given power, as ten per cent. is absorbed by the clearest globe, and from twenty to fifty per cent. by a clouded one.

The Consolidated Electric Light Company of Portland has for some time supplied about 100 arc lamps for street purposes. The cost to the city is practically no greater than by the old gas system, as large new areas are reached, and many times more light diffused. Every effort has apparently been made by the gas officials to discourage the use of the electric light, and the bills for the portion not covered by the improvement were excessive. The discussion which followed was animated. The city owned two-fifths of the entire issue of gas stock, but notwithstanding this, its needs were so urgent, and the old system so poor, that when the "Municipal" method offered Manager Sawyer a chance to bid for the entire contract, a figure was proposed which brought an appreciative response from the entire City Government. As a result, the American Electric Manufacturing Company of New York has undertaken to complete in thirty days the installation of 250 Edison lamps, to be operated by dynamos in the arc station and from the same steam plant.

Before the coming of the electric system, 468 gas jets and 125 naphtha lanterns were employed, and by night the main streets of Portland were but dimly lighted, while those of the outskirts were, metaphorically speaking, like the labyrinths of the Roman catacombs, full of "darkness which might be felt." Now a much larger territory is covered, and 125 arc lamps and 250 Edison "municipals" will make the city the brightest in New England, and one of the best lighted in the country. Where feasible, the old lamp-posts will be utilized. With the starting of the engines in the early evening twilight, the whole combined system will spring into brilliancy, to be extinguished as quickly with the returning light of morning. Two special Edison dynamos will be installed, each operating from an engine driving an American generator with the companion pulley.

This will be the first illustration of the newly outlined policy of the American Company, in combining as intimately as possible, under one management and one roof, the arc and incandescent interests. A general system of Edison inside lighting will doubtless follow at an early day, not only in Portland, but in any city where the same methods are pursued.

Another Hearing by the Underground Wire Commission.

The Underground Wire Commission has now secured a permanent location at No. 23 West Twenty-third street, in this city, and is giving a hearing almost daily to the proposers and inventors of methods for placing wires under ground. Among the communications received by the Commissioners this week was one from Mr. J. Dewey, of Bloomingdale, N. J., who proposes to lay the wires in a large iron tube, with a smaller inner tube to accommodate those of the electric light companies. The larger tube is to be made in two sections, the upper one being movable, so that the wires can always be reached for repairs. The insulation proposed by Mr. Dewey is gutta-percha.

Edward M. Bentley, representing the Bentley-Knight Electric Railway Company, appeared before the board with a number of maps and plans designed to show a conduit which he claimed would fulfill the conditions required by the board. The main difficulty in placing the wires under ground, Mr. Bentley said, would arise from induction, and this no amount of insulation could overcome if the wires were placed in close proximity to each other. The telephone wires in Paris are double, and the two inducing currents going in opposite directions neutralize each other according to a well-recognized electrical principle. Mr. Bentley's plan proposes the use of a common metallic return, which shall act on a number of wires instead of on one, as in the Paris double wire system.

John B. King presented the model of a conduit to be constructed on the upper arch of the sewers, following the arch in form, and separated into sections for the accommodation of the different kinds of wires in use. General Averell, of the Insulating Conduit Company, exhibited a model of a section of a solid conduit invented by himself. The model is one foot square, and contains nearly 400 wires. The material is silica and asphaltic cement, the compound being built up in layers about the wires after being heated to a temperature of about 230°. General Averell claimed that the wires were perfectly insulated by being incased in this material, that the asphaltic cement had no static capacity, and that there was no fear of any great disturbance by induction. He proposed to separate the electric light from the other wires by placing them in an addition to his conduit above. Precisely how the wires were to be reached for repairs, or how a defective wire could be replaced in the heart of his solid conduit, he did not explain. After listening to his description the commission adjourned.

The Crompton-Burgin Apparatus at the London "Inventories."

The interesting machines and lamps exhibited by Messrs. R. E. Crompton & Co. at the "Inventories," are shown in the accompanyiug illustrations, for which we are indebted to the *Mechanical World*.

The Burgin armature in its construction departs considerably from the better known ordinary types of Gramme and Siemens armatures. The coils are wound on the sides of regular hexagons made up of iron wire. The hexagons are about 1½ in. square in section, and the number of rings in the armature varies from 4 to 10. The hexagons are mounted on gun-metal spiders which project into the angles and are keyed to the spindle of the machine. This armature has the great advantage of allowing a very free circulation of air to conduct away the heat generated in the coils by the current. It is also easily constructed and kept in repair. Mr. Crompton found, however, that an advantage in efficiency was gained by reducing the number of the hexagons and increasing their section. This was probably owing to the saving due to the decrease in the quantity of wire passing round the sides of the coils, which wire being parallel to the direction of the magnetic lines of force, was not of any service in producing the current and introduced a considerable amount of extra internal resistance. Figs. 1 and 2 show the latest improvements upon the Burgin machines.

The new Crompton machine, Fig. 3, is an entire departure from the lines on which the Burgin was built. The magnet cores, instead of being made, as in the Burgin, of cast iron, are now made of best Swedish wrought iron. The whole surface of the iron is planed bright and polished all over, and more especially at the end pieces, so as to insure magnetic continuity as nearly as possible, as if the whole were in one piece. The armature of the Crompton machine is a simple "Gramme" ring of special construction.

The Crompton-Crabbe arc lamp, Fig. 4, is the joint production of Mr. Crompton and of his works foreman, whose name appears in the patent, and is a very ingenious and well-thought-out piece of mechanism.

The details of construction of this lamp will be understood by reference to the diagram, Fig. 5. *A B* is a differential electro-magnet, of which *B* is the shunt and *A* the main coil, with a movable core hung from a spring at the top and carrying in a stirrup piece the ends of two arms *C* and C^1, which are pivoted to the sides of the lamp; on these arms rest the carriages by pins, which are fixed to their bodies. These carriages have in their axles a small toothed wheel which gears into the rack-rods *E* E^1, carrying the positive carbons. On each end of the axle is fixed a large brake-wheel, which is revolved by the motion of the rack. A regulating screw is provided, by which the tension of the spring carrying the movable core of the magnets is adjusted. This spring is intended to compensate for the weight of the carriages, rack-rods and positive carbons. It is to be observed that the pin supporting one carriage is slightly longer than the other. A resistance equivalent to that of the lamp is inserted in the cut-out.

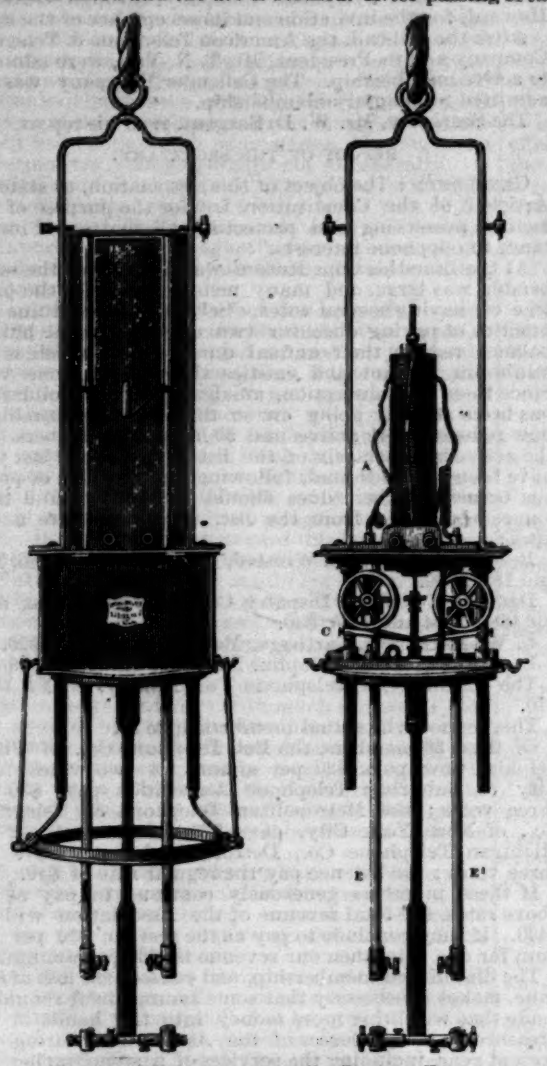


FIG. 4. CROMPTON-CRABBE LAMP. FIG. 5.

The action of the lamp is as follows: The current first passes round the magnet *A*, lifting the core with its appendages the movable arms and carriages with their rack-rods. As one pin is shorter than the other, its rising arm will engage with the wheel of its carriage, preventing it from revolving and keeping the rack-rod *E* from moving downward, while the wheel of E^1 is still free to move and the rack-rod to which it is geared is still free to fall; or rather, in the first instance, the carriage is free to move pthe rod, leaving it at rest, and to leave its carbon in contact with the negative carbon. This proceeds until the arm has risen far enough to touch both the pin and the periphery of the wheel. The wheel then ceases to revolve, the rod is lifted and the arc is formed. After passing *A* the current is led to the body of the lamp, which is in circuit with the positive carbon. The negative carbon is insulated from the lamp. A shunt wire is taken from the lamp

FIG. 2.—CROMPTON-BURGIN ARMATURE.

body round magnet *B* and to the negative terminal. This wire is wound in the opposite direction to that on *A*, and thus, it will be seen, tends to pull the core downward. The amount of current flowing in this shunt is, of course, proportional to the resistance of the arc, with which it is connected in parallel circuit. So soon, therefore, as the arc is formed, the shunt magnet begins to draw down the core. As the arc lengthens the core continues to travel downward, feeding down the top carbon until the arm C^1 disengages from the wheel and the rack is allowed to fall a short distance independently, after which, the state of equilibrium being reattained, the core rises to its original position and the downward motion proceeds as the carbons burn away.

A plate comes in contact with the bottom of the magnet to prevent the core rising too far from the momentum required when receiving the upward pull from the magnet.

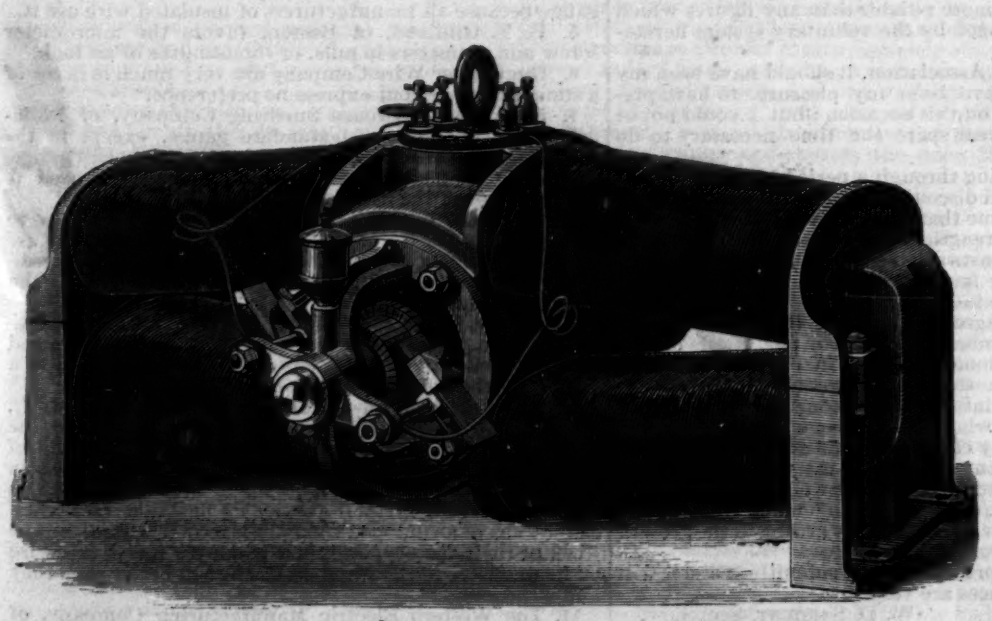


FIG. 1.—CROMPTON-BURGIN DYNAMO.

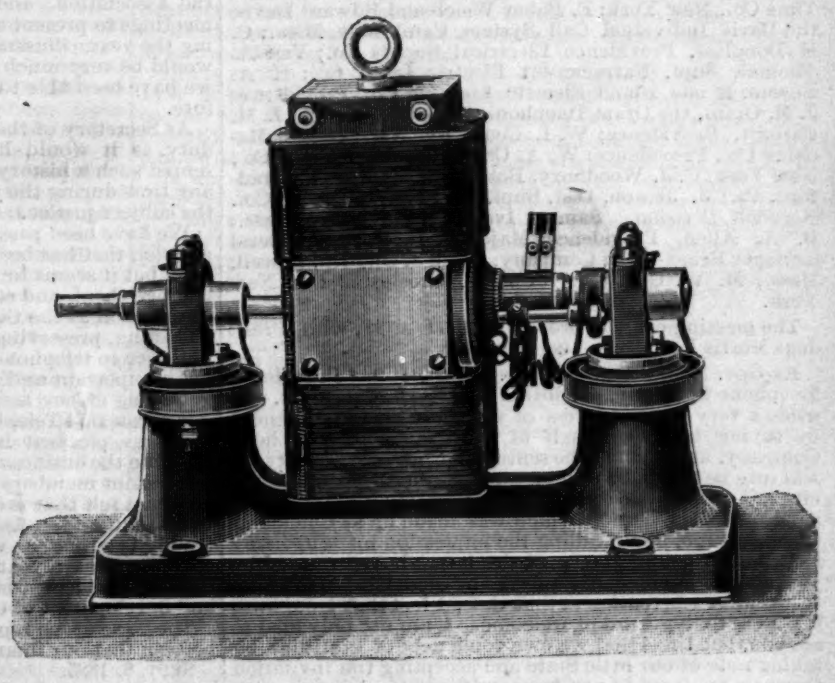


FIG. 3.—CROMPTON DYNAMO.

The Kauffer Open-Circuit Battery.

In this battery the porous cup is suspended from a tightly-fitting lid, thus gaining the exposure of the bottom surface, while the lid prevents evaporation and all the connections may be removed with perfect ease. The material for the cell is supplied in the form of a paste, an anhydrous solvent, to which water only need be added. It is claimed to be cheaper, more effective, and to last longer than sal-ammoniac, and not to clog up the cup. Measurements made by an electrician in Boston show that the cell possesses an electromotive force of 1.57 volts and a resistance of 1.9 ohms.

A Forced Abandonment.

The scheme for an electric railway in Fairmount Park, Philadelphia, has been abandoned because the projectors concluded that with the conditions imposed by the Park Commission the road would not prove a profitable investment. As at first proposed, the road was to run along Belmont avenue from Elm avenue to Highland avenue, and the builders agreed to light Belmont avenue for the whole distance along their track. The permit was subsequently modified to avoid interference with the numerous drives that cross Belmont avenue, and the route prescribed for the road was from Belmont avenue, just north of the Ohio building, to George's Hill, while Belmont avenue was still to be lighted from Elm to Boundary avenues by the owners of the road. The distance that the road could run was so short and the expense of lighting Belmont avenue with electric lights, when the track was not laid along it, was so great that the builders addressed a communication to the Park Commission relinquishing the right granted them, and the plan has been definitively abandoned. The same gentlemen have arranged to make a trial of their system on the Ridge Avenue Railway.

Organization of Electric Lighting Companies.

Two new electric lighting companies were organized in this city last week; the points of operation, however, to be in Massachusetts. The first is to be known as the American-Edison Illuminating Company, of Worcester, Mass., and the other having similar name, but for operation in Lowell, Mass. The directors of both companies are: Edward H. Johnson, President of the Edison Electric Light Company, of New York; Edward H. Goff, President, and W. J. Jenks, Manager, of the Incandescent Department of the American Electric Manufacturing Company, of New York; Col. Silas Burney, Tremont House, Boston, and Charles B. Whitney, banker, at Worcester, Mass. The companies have capital respectively of $100,000 and $50,000.

The contract made last week by the American Company, of this city, to light the entire city of Portland, Me., in which the American Company will use a large number of the Edison municipal incandescent lamps, was the initial work under the American-Edison compact made in the early part of the summer. Central lighting stations are now to be introduced into Worcester and Lowell, Mass., and it is understood that the American Company is now laying its plans for general street lighting in every city in New England. The officers of the company claim that with the combination now existing between the American and Edison Companies in using their arc and incandescent lights, with the great improvements which have been recently made, they can successfully compete with gas at any price at which it can be sold with profit, and give at least three times the amount of light for the same money.

National Telephone Exchange Association.

The seventh annual convention of the National Telephone Exchange Association began at the Narragansett Hotel, Providence, R. I., on Tuesday, the 8th inst. The gentlemen in attendance as active members, honorary members or visitors were the following:

C. N. Fay, general manager, and B. E. Sunny, superintendent, Chicago Telephone Company; W. H. Eckert, general superintendent, and J. A. Seely, electrician, Metropolitan Telegraph and Telephone Company; D. I. Carson, general superintendent, C. E. McClure, John D. Easterlin, W. J. Cole, district superintendents, Southern Bell Company; William R. Driver, treasurer, Gen. Thomas Sherwin, auditor, J. E. Hudson, general manager, C. Jay French, assistant general manager, Thomas D. Lockwood, electrician, J. B. Van Sise, assistant electrician, American Bell Telephone Company; J. M. Brown, T. B. Doolittle, A. O. Morgan, Robert S. Boyd and C. R. Truex, special agents, American Bell Company; Edward J. Hall, Jr., general manager, American Telephone and Telegraph Company, New York; Gov. Henry Howard, president, Henry C. Cranston, vice-president, J. M. Starkweather, director, J. W. Duxbury, general manager, A. C. White, superintendent, Providence Telephone Company; H. L. Storke, Empire State Telephone and Telegraph Company; Hugh C. Baker and Charles F. Sise, Bell Telephone Company, of Canada; J. J. Fowler, assistant general manager, Great Southern Telephone Company; C. F. Cutler, president, Joel C. Clark, Treasurer, W. D. Sargent, general manager, C. H. Barney, superintendent, J. C. Reilly, district superintendent, New York & New Jersey Telephone Company; Morris F. Tyler, president, and H. P. Frost, general manager, Southern New England Telephone Company; J. N. Keller and J. J. Carty, New England Telephone and Telegraph Company; Ellis B. Baker, general superintendent, Southern New England Telephone Company; Samuel M. Bryan and A. Wilson, Jr., Chesapeake & Potomac Telephone Company; George F. Durant, general manager, Bell Telephone Company, of Missouri; Wm. Ker, Pennsylvania Telephone Company, Harrisburg, Pa.; S. H. Cowles, general manager, The Bell Telephone Company, Buffalo, N. Y.; W. N. Eastabrook, New York & Pennsylvania T. & T. Company, Elmira, N. Y., George N. Stone, C. & S. Telephone Association & Bell Telephone Company, Cincinnati, O.; A. B. Uline and W. H. Cull, Hudson River Telephone Company; Henry Metzger, general manager, Central District and Printing Telegraph Company, Pittsburg; J. B. Speed and James Clark, Ohio Valley Telephone Company, Louisville, Ky.; R. M. Bailey, Central Pennsylvania Telephone Company, Williamsport, Pa.; C. A. Nicholson, Utica, N. Y.; Clark B. Hotchkiss, Day's Kerite Cables, New York; John M. Pendleton, president, Equitable Electric Company, New York; Henry M. Smith, Washburn & Moen Mfg. Company, Worcester, Mass.; Willard L. Candee and Messrs. Smith & Wetmore, Okonite Company, New York; Col. Fred. A. Mason and Henry D. Stanley, Bridgeport Brass Company; E. V. Cherry, vice-president, and Isaac and E. A. Kinsey, Standard Electrical Works, Cincinnati; W. M. Callender, Callender Insulating and Water-Proofing Company; Henry L. Shippy, manager, John A. Roebling's Sons Co., New York; T. C. Martin and Clarence E. Stump, THE ELECTRICAL WORLD; E. M. Barton, H. B. Thayer, F. W. Harrington, C. A. Rolfe, and W. R. Patterson, Western Electric Company; John W. Beane, New York; J. Chester Wilson, general manager, Clark Insulated Wire Company, Philadelphia; C. W. Price, New York; Ralph W. Pope, New York; E. T. Gilliland, Boston; R. S. Waring, G. L. Wiley and J. W. Marsh, Standard Underground Cable Company; Eugene F. Phillips, president; W. H. Sawyer, secretary and electrician, Fred. H. Angell, J. O. Darling, American Electrical Works; H. N. Fenner and Mr. Blauvelt, New England Butt Co.; J. A. Palmer, general manager Brooks Underground Cable Co.; George H. Bliss, of Bliss Individual Signal; John Crawford, late chief engineer International Bell Telephone Co., Russia; Henry L. Bailey, Telegraphic Time Co., New York; E. Baker Welch and Edward Davis, the Davis Individual Call System, Cambridge, Mass.; C. H. Douglass, Providence Electrical Supply Co.; Van A. Thomas, Supt. Narragansett Electric Light Co.; H. A. Bowen, Rhode Island Electric Lighting Co., Providence; J. M. Oram, the Oram Telephonic Time Co., Boston; E. M. Carhart, Providence; W. L. Coop, the Narragansett Machine Co., Providence; W. A. Childs, Law Telephone Co., New York; C. J. Woodbury, Boston; F. A. Newell, Bradford, Pa.; J. Jepson, Dist. Supt. So. N. E. Telephone Co., Norwich Division. Samuel Ivers, New Bedford, Mass.; B. A. Allen, Providence; Major J. B. Powell, general manager Brush-Swan Company; Chas. J. Glidden, Lowell, Mass.; M. W. Goodyear, of E. S. Greeley & Co., New York.

The meeting came to order about 11 A. M., with President Morris F. Tyler in the chair.

Ex-Gov. Henry Howard, President of the Providence Telephone Company, was introduced by the President, and made a very happy address of welcome. He commenced by saying that, in behalf of the Providence Telephone Company, and voicing the sentiment of the community, he was sure he extended a sincere and cordial welcome to the city and State. He continued: "Remembering the character of the convention which was made up at Cincinnati two years ago, and recalling the impression made upon my mind as to the importance of the interests represented by you, and the intelligence displayed by those who were prominent in the convention at that time, I feel that I ought to say more than a word of welcome. I am not only glad to see you, but I feel that we owe you a debt of gratitude by taking note of our little State and accepting the invitation formerly tendered to you by myself and honoring us with your presence to-day. Words of welcome are ofttimes a mere form, and I can hardly express how deeply I feel in greeting you. You represent a great and growing interest, and I am sure the entire community will be benefited by your discussions. While I cannot extend to you the freedom of the city, yet I know that you will be welcomed by the citizens at their homes and workshops. I hope you will carry away pleasurable recollections of the city. The Providence Telephone Company desires to extend to you the hospitalities of an excursion down what we are in the habit of calling our beautiful bay. We have arranged that the steamer Philadelphia shall be at your disposal at 1 P. M. Thursday next, for a sail of four hours, returning at 5 P. M. We hope that you will make your arrangements so as to shorten your business on that day. I hope that the occasion will be agreeable, and that you will have a safe return to your homes. [Applause.]

President Tyler briefly replied, saying that, as chairman of the Convention, he felt justified in returning thanks to the Providence Telephone Company, through Governor Howard, for the invitation and its acceptance of the same.

After the roll-call, the American Telephone & Telegraph Company and its President, Mr. T. N. Vail, were admitted to active membership. The Callender Company was also admitted to honorary membership.

The Secretary, Mr. W. D. Sargent, read his report.

REPORT OF THE SECRETARY.

GENTLEMEN: The object of this Association, as stated in Article 2 of the Constitution, is "for the purpose of collecting, preserving and protecting all matters of importance to telephone interests."

At the time this Constitution was formulated the membership was large, and many members paid for the privilege of having several votes. Several still continue this practice of paying dues for two or three votes, but the balance reduce their annual dues to $10, which is the minimum amount and entitles them to but one vote. Since then the absorption, amalgamation, consolidation, has been steadily going on, so that our membership is now reduced to 41 active and 30 honorary members. Of the active members, six on the list as published last year have been absorbed, and, following the customs of previous occasions, their dues should be remitted and their names be stricken from the list. The names are as follows:

Beach & Hunt, West Winsted, Conn., dues for 1883, 1884 and 1885, $30.

Danbury Telephone Dispatch Co., Danbury, Conn., dues for 1883, 1884 and 1885, $30.

C. W. McDaniels, Carthage, Mo., 1884 and 1885, $20.

Loomis & McDaniel, Joplin, Mo., 1884 and 1885, $20.

The Commercial Telephone Co., Albany, N. Y., 1885, $10.

This reduces the actual membership to 36.

Of these 36 members, the Bell Telephone Co., of Philadelphia, now pays $20 per annum for two votes; the City & Suburban Telephone Association pays $30 for three votes; the Metropolitan Telephone & Telegraph Co., of New York City, pays $30 for three votes; the Michigan Telephone Co., Detroit, Mich., pays $30 for three votes; the balance pay the regular rate of $10.

If these members generously continue to pay at the above rates, the total revenue of the Association will be $430. If they conclude to pay as the rest do, $10 per annum for one vote, then our revenue is $360 per annum.

The diminished membership, and consequent loss of revenue, makes it necessary that some arrangement should be made that will bring more money into the hands of the Treasurer. The expenses of the Association during the present year, including the services of a stenographer for the Philadelphia meeting and the printing of the proceedings of that meeting, amount to $869.85, to which should be added the customary amount for the Secretary, which is $300, making a total of $1,169.85. This includes two years for the Secretary.

A number of the Proceedings of the Association are still on hand, but the sales have not met the expense of printing them.

At the Philadelphia meeting, a resolution was adopted which abolished the standing committees and placed their work in the hands of the Secretary, who, by and with the advice of the President, was to select certain members of the Association to assist him in gathering the information heretofore done by the various committees. In pursuance of this resolution, the most important subjects were assigned to the various members, and others were asked to contribute papers. The success of this arrangement can best be judged by the results of this meeting.

The future of the Association deserves most serious consideration, and the writer, after several years' experience on two different committees, and this year as Secretary, is more and more impressed with the idea that we should employ a secretary at a salary sufficient to enable him to devote his time entirely, or nearly so, to the business of the Association, and who would be able at each of our meetings to present a concise history of the business during the year, illustrated and amplified by statistics that would be very much more reliable than any figures which we have been able to get by the voluntary system heretofore.

As Secretary of the Association, it should have been my duty, as it would have been my pleasure, to have presented such a history on this occasion; but I could not at any time during the year spare the time necessary to do the subject justice.

We have been passing through a period of business depression that has been discouraging to many of our members, but it seems to me that these very trials ought to encourage them, and strengthen the bonds which unite the Association as the Constitution says "for the purpose of collecting, preserving and protecting all matters of importance to telephone interests."

An important and agreeable event of the year was the gathering of our members at Boston as the guests of the American Bell Telephone Company, in July last. Such meetings, pleasant in themselves, are also calculated to promote the business interests of all concerned. Some of our distant members who were present at that meeting have not felt that they could spare the time and expense of attending the present Association meeting. I think this feeling is wrong, as we can certainly well afford to come together twice a year, considering the many varied and difficult problems that are constantly arising in the growth and development of our business.

The Treasurer's report is herewith submitted; and it will be seen that our finances are very low.

SEPT. 8, 1885. W. D. SARGENT, Secretary.

The report of the Treasurer showed a cash balance in hand of $37.45.

A report of the Executive Committee was presented recommending that the Secretary should be paid a salary not to exceed $100 per month, and that an assessment be made on the members for $50 to meet expenses. This was considered later in the day, and also the desirability of locating the Secretary permanently in Boston or New York, and calling upon him for copious statistical information.

An invitation was read from the American Bell Company, for the Convention to visit Leicester, Mass, on the 12th, and examine there the working of what is known as the "village system;" a special car to be provided.

President Tyler then said that the next business was the election of officers for the ensuing year, and he took occasion in retiring from office to make a neat and brief review of the history of the Association, dating from September, 1880. He said: "When we met in Niagara five years ago, we were more numerous than we are to-day, notwithstanding the attractions of this place and the blandishments of the day. We were in a state of enthusiastic uncertainty five years ago, but I don't think there was a single company that could put their finger on their books and say they were making a cent, or could say they expected to make a cent. There was an indefinite enthusiasm and a season of wild hope indulged in, and in 1882 we were self-contented men who did not know when the end could be. In 1883 we were not so enthusiastic, and in 1884, at Philadelphia, we were blue. We have been through the period of eagerness and expectancy in the beginning, and through the flush of unexpected success, and have now reached the period of steady, unremitting work, of constant anxiety, of careful forecast, not only for to-morrow, but for next year, and have reached a position in our business of maturity threatened with all the dangers of a legitimate business, and burdened with all the responsibilities of very large interests to care for. It would be ungracious for me, perhaps, to point out to you the mistakes of the last five years, which you all know perfectly well. But of the relations of the licensee and the licensor I might say something a good deal to the advantage or the disadvantage of both sides. It can be said by all of us without any reflection that the plan upon which the business was started and the general plan upon which it has been attempted to regulate the relations of licensee and licensor has had some mistakes. But after all our experience we have reached the bottom of the curve and are beginning to rise. How far we shall go on the upward grade no one can tell. We are largely dependent on the condition of general business, though not so much perhaps as other industries are. I believe there are signs of continued improvement, and I think there is no honest observer of the affairs of the country but believes that a period of steady improvement has set in—not a speculative, but a permanent, prosperous outlook. Let us be careful that we avoid the mistakes of past periods, and within a reasonable time we shall find ourselves upon that delightful basis upon which some of the licensees now stand, where we can pay a dividend upon all of our stock after taking out our expenses."

The Convention then proceeded to the election of officers, with the subjoined result:

President—C. N. Fay, of Chicago.

Vice-President—George F. Durant, of St. Louis.

Secretary—Gen. C. H. Barney, of New Jersey.

Treasurer—H. L. Storke, of New York.

Advisory Committee—W. A. Jackson, of Detroit; B. E. Sunny, of Chicago; Morris F. Tyler, of New Haven.

Executive Committee—C. N. Fay, of Chicago; James Bigler, of Newburg, N. Y.; R. M. Bailey, of Williamsport; C. F. Cutler, of New York; Henry Metzger, of New York.

Vice-President Durant was called to the chair, in the absence of President-elect Fay, and made a brief acknowledgement of the honor.

Mr. Sargent then offered a motion that the Association meet at St. Louis next year, the time being left to a committee, consisting of Messrs. Carson, Estabrook and Metzger, to report later.

Mr. W. D. Sargent, upon the call for reports of committees, presented the following report from the Committee on a Standard Wire Gauge, prefacing it with the statement that it might be regarded more as a personal than as a joint report, the other members of the committee, Messrs. D. I. Carson and Mr. T. B. Doolittle, not having signed it. Mr. Doolittle, too, he knew to be opposed to some of its conclusions:

REPORT OF COMMITTEE ON WIRE GAUGES.

Your committee on wire gauges received replies from the following parties:

1. Clark Insulated Wire Company, Bristol, Pa., favor the English standard gauge, and state that the present uncertainty in gauges is an embarrassment to their business.

2. W. A. Jackson, of Detroit, Mich., is in favor of a Standard gauge, but has no preference.

3. C. N. Fay, of Chicago, favors the English gauge because we buy more or less wire in England.

4. Alfred F. Moore, of Philadelphia, favors the American gauge because all manufacturers of insulated wire use it.

5. E. T. Gilliland, of Boston, favors the micrometer screw and diameters in mils, or thousandths of an inch.

6. The Palmer Wire Company are very much in favor of a standard gauge, but express no preference.

7. The Phosphor Bronze Smelting Company, of Philadelphia, favor the English standard gauge, except in the finer sizes, and think if no standard is adopted that all gauges should be abandoned and the micrometer screw used to indicate sizes of the decimal part of an inch.

The Standard Electrical Works, of Cincinnati, desire to see a standard wire gauge established because they are constantly annoyed by orders for wire, but without specifying the individual gauge. Their preference is the American gauge.

9. Holmes, Booth & Haydens, of New York, are sensible of the importance of a standard gauge, and recommend the adoption of the English gauge, so that there will be a uniformity between the two countries.

10. The American Electrical Works, Providence, R. I., say that they are greatly annoyed in their business by the multiplicity of gauges. They favor the entire abolition of all guages, and wires to be identified by their diameters in thousandths of an inch. In practice, they find that this plan works well in their particular business, and they claim to have abandoned the use of special gauges in the work of their factory, and their employés know the wire by its diameter in thousandths of an inch better than they know the gauge.

11. The Western Electric Manufacturing Company, of Chicago, believe that the American gauge and the English standard gauge are the only two to be considered. They prefer the English standard gauge, because we can never hope that the English will adopt ours, and it is a matter of considerable importance to have a uniform standard gauge wherever the English language is used.

12. Clark B. Hotchkiss, of the Kerite Wire, suggests the English gauge and the American gauge, but with a preference for the English, because it is in use both in France and England.

13. D. H. Bates, President of the Baltimore & Ohio Telegraph Company, thinks the Birmingham guage is the nearest to perfection of existing guages, but is much interested in any movement looking toward the establishment of a uniform guage. He thinks the numbers given with a given diameter should bear some definite relation to the

measurements in mils, and wishes to know the result of our deliberations.

14. The Callender Insulating Company believe that it is of the utmost importance that one uniform gauge should be adopted, and that it would be an immense advantage if it could be made international. They recommend the English gauge in preference to all others.

15. Washburn & Moen believe that the decimal or metric system of gauges would be the best to adopt. They were the first concern to use the "V" gauge in the world, and state they have found it convenient and reliable and by its use have avoided much annoyance. They express no preference for any particular gauge, but believe that any that would be standardized would soon be generally adopted by manufacturers.

The Western Electric Company supplement their first reply by the following memorandum from their agent in Antwerp: "You may not be aware that there is no ascertainable gauge in use by the English. The brass people, for example, do not know the gauge called 'B. W. G.' in your telegraph catalogue, and the only way to get what you want is to give the sizes in mils. So far, I have heard of no move among the English to adopt a new standard gauge, and until they adopt that I do not see that you are going to gain anything by abandoning the American gauge which people now understand. The English gauge has been legalized by the Board of Trade, but this amounts to no more in practice than the legalization of the metric system in America. The metal people are all against the new gauge, and say it was made up by a set of people who knew nothing about the thing practically. Perhaps they say this because they were not consulted in the matter."

Mr. Barton, of the Western Electric Company, commenting on this memorandum, says: "The great difficulty about gauges at present is that there are no safe gauges in common use. The convenience of the public is not so much to get any new gauge adopted as to get all the gauges in use, except one, discontinued. The united association might now secure the almost universal adoption of the American gauge, while in my judgment the adoption of the English gauge would result only in adding one more to the number of gauges now in use. I have learned by discussing the matter with general drawers in the United States that they would much prefer to adhere to the American gauge."

Your committee have placed themselves in communication with all the parties interested. While we have no written or official reply from the Western Union Telegraph Company, we are inclined to believe that if this association would favor the adoption of the English gauge, they would co-operate with us.

The replies come from fifteen different parties; seven favor the English and two the American gauge; six have no preference.

The work of investigating the origin and development of the numerous gauges in various countries, analyzing and comparing their merits and discarding all the advantages without making too great a departure from the Birmingham wire gauge, which is the most generally used, is so thoroughly done by a committee of the British Society of Electrical Engineers that the committee feel that they will honor themselves and gratify their English friends by accepting their conclusions, and recommending the English standard gauge as the one best adapted to the wants of this country, and in lieu of any arguments of their own in favor of this decision, we refer the members of the association to the report of the English Society, published in Volume VIII. of their proceedings.

Mr. W. H. Preece, a member of this committee, has very kindly furnished your committee with the Instructions and Orders of the British Board of Trade, legalizing and making this the standard gauge of Great Britain. He also furnished a number of copies of the gauge, which we submit to the inspection of members.

The committee desire to express their thanks to Mr. Preece for his courtesy in furnishing them with all the information on the subject, as far as the British government was concerned.

W. D. SARGENT.
D. I. CARSON.
T. B. DOOLITTLE.

Motion was made that the new English standard gauge be adopted.

Mr. Clark B. Hotchkiss pointed out that the French, English and Germans had practically adopted this gauge.

Mr. Callender suggested a conference on the subject with electric light people.

Mr. Sargent opposed this idea, and stated that the new gauge proposed was simply the old familiar Birmingham gauge standardized—all its irregularities taken away. It was scientifically just as perfect as the American guage, and was preferable as being, if adopted, common to Europe and America, *i. e.*, international.

Mr. Lockwood was strongly in favor of the new English standard gauge, for the reasons urged by Mr. Sargent. Any standard, he remarked, was better than the present lamentable need of one, or multiplicity of standards not universally recognized. Perhaps as they came to a better conditions of things, purchasers of wire would order not only wire of so many mils, or of such a number, but of certain specific resistance per pound or per mile, as the case might be.

Mr. Chester Wilson reminded the convention that a great many efforts had been made unsuccessfully to get a uniform gauge into use, and that the aim had been not so much to get any given standard adopted for its own sake, as to set up a standard by which contracts in dispute could be legally passed upon and enforced.

Mr. Carson said that as a member of the committee he indorsed the report, but that Mr. Doolittle did not.

Mr. Durant remarked that the object should be to get action from Congress on the matter.

Mr. Sargent said that he was prepared to move that as far as possible the members of the Association adopt the new English standard wire gauge.

Mr. Callender wished to offer an amendment to the effect that the electric light people be first consulted.

Mr. Lockwood thought that the electric light people had shown too great a disregard of the welfare of their telephonic brethren to have this compliment paid them.

Adjourned till 3 P. M.

After adjournment Mr. Doolittle, with the aid of a chart giving dimensions of various gauges, made an able speech in favor of the Brown & Sharpe gauge, deprecating any attempt to adopt the revised Birmingham gauge, which was not in practical use like the other, but was theoretical and not universally recognized even where officially approved.

Mr. Hotchkiss said that he had supplied some foreign governments with wire, and that all their specifications called for a wire conforming to the requirements of the new English gauge. There were, he believed, some twenty odd gauges in the world, but it was desirabe to arrive at uniformity as regards the diameter and weight of the wire.

Mr. Charles F. Sise stated that in Canada they bought their wire from English manufacturers, who four years ago had each a separate gauge, but who now all followed the new standard gauge, the only legal gauge in England. In Germany, whence they got a great many cables, the government had adopted the same gauge. In France it was also recognized, though perhaps not so generally.

Mr. Doolittle said that it was not alone line wire that was concerned, for that was but a very small part of the general use of wire. The question related as well to office wire, annunciator wire, magnet wire—all the kinds that entered so largely into manufacture. It was here that confusion came in.

Mr. H. L. Shippy recalled the fact that some few years ago the large wire manufacturers discussed this question of uniformity for a long time and arrived at no result. The elements were too discordant, and if the association adopted this gauge, there would not necessarily be a change in other lines of manufacture.

Mr. Sargent said that the very confusion that had been alluded to arose from the fact that there had been no standard gauge. The largest manufacturers of wire are in England, and they have adopted this gauge, which is an improvement on the Birmingham gauge, which is in the widest use. It is not well to disregard this because of any sentimental feeling prompting them to use the other.

Mr. Doolittle, disclaiming any sentiment in the matter, said that what they wanted to do was to avoid confusion. They had been a quarter of a century trying to perfect their system, and now to attempt to introduce another gauge would be to introduce confusion.

Mr. E. M. Barton maintained that one wire gauge for this generation would not meet with much success, if that work was spoiled by the introduction of yet another. For sheet metal generally the Brown & Sharpe gauge was used, and that practice could not be easily changed. He would like to see a movement to concentrate on the Brown & Sharpe gauge. No matter, however, what gauge is introduced, they would have to fall back on the relation of thousandths of an inch.

Mr. Lockwood said that no matter what gauge is adopted, it is probable that corporations ordering wire would say in thousandths of an inch what they wanted. He had no doubt as to the propriety of indorsing the views of the European countries on this matter.

Mr. Eckert did not believe there were six gentlemen present who could tell the difference between the gauges.

Mr. C. N. Fay (in the chair) said that he would be glad to see the weight of the Association cast in favor of a uniform gauge throughout the world. This uniformity is creeping into commerce as well as in mathematics, and the Association ought not to delay action looking toward a uniform standard guage.

Mr. Durant said that if all associations could be bound by the action of this Association, the passage of the resolution would do come good, but he could not see at present that it would amount to much.

Mr. Metzger said he could not see what good the resolution would accomplish, unless they make a standard that could be enforced by law. What was wanted is something by which, if a dispute arises between the buyer and seller, there shall be a regular standard which shall decide the controversy.

Mr. Wilson, of Philadelphia, said that so long as they adopted the American gauge, there would be two in the world; but by recognizing the English standard gauge, they were working in the direction of one uniform gauge and not two. If the telephone association added its strength by this recognition of the English standard, one step will be taken toward the adoption of a universal gauge. He hoped the vote would be strong in favor of the English standard wire gauge, which would be an independent movement toward actual uniformity.

The resolution then put to the meeting, and passed with only a few dissenting votes, was as follows:

Resolved, That this Association, so far as they can, will adopt the English standard gauge for their future work.

In accordance with suggestions made by a number of the members, the Secretary was instructed to furnish to the members in circular form a complete statement of the new standard gauge, including a statement of weights per mile of iron and copper, and the resistance per mile of each number of gauge; and also notify other electrical societies and electrical manufacturers of the adoption of the standard gauge, and express the hope that they will follow their example.

The Convention then went into a lively discussion on the recommendations of the Executive Committee, held over from the morning, as regards assessment to meet expenses. It was finally agreed, on motion of Mr. Tyler, that the Advisory Committee be empowered, when it may be shown that the assessment is burdensome, to remit to the member not more than $20 of his tax. The amendment was carried, and the resolution as amended passed.

The second recommendation was in the nature of an amendment to the constitution, so that the annual dues shall be $50, instead of $10, which was laid over until the next meeting, under the rules.

The third recommendation was to the effect that it was deemed advisable to employ a secretary at a salary not to exceed $100 per month. The recommendation was approved.

The fourth recommendation contemplated an amendment to the constitution providing that a paid secretary shall be appointed by the newly elected executive committee, rather than by the Association, as formerly. The matter was laid over under the rules.

Mr. Storke offered an amendment to the by-laws, enlarging the duties of the Secretary in the compilation of reports and statistics presented by the several committees, under the direction of the Executive Committee. The matter was laid over under the rules.

An invitation was read from the Pawtucket Thread Company to the Association, to visit the works, and the invitation was accepted with thanks.

At 5 o'clock an adjournment was taken to Wednesday morning at 10:30 o'clock.

WEDNESDAY'S PROCEEDINGS.

Business was duly resumed at 10:30 A. M. on Wednesday, with the President, C. N. Fay, in the chair:

Mr. Carson, from the committee on time and place of the next annual meeting, presented a unanimous report recommending that St. Louis be the place, and the first Tuesday in September as the time. The report was adopted.

Mr. Hall gave notice of an amendment to the constitution. He had found that there were 41 active and 31 honorary members, showing that the membership was nearly equally balanced. His amendment contemplated the establishment of regular and associate, the latter not being directly concerned in telephonic occupation. His amendment to article 2, section 1, is to the effect that any honorary member may be elected by a two-thirds vote of all the members present at any one meeting, such election to be by ballot. He also presented a new article, to the effect that any person or corporation actively interested in the objects of the Association may become associate members by a majority vote of the members present. Section 2 provided that associate members shall have no vote, but shall be entitled to all other privileges of regular members and be subject to the same dues and assessments.

The amendments were laid on the table for consideration at the next meeting.

The first paper presented for the day, that of Mr. A. S. Hibbard, of the Wisconsin Telephone Company, on "Some Practical Results of Long-Distance Telephoning," was then read by the ex-secretary, W. D. Sargent, as follows:

MR. HIBBARD ON LONG DISTANCE TELEPHONY.

Since the first introduction of the telephone its possibilities as a "far speaker" have been the subject of most engrossing interest.

Scarcely had the results of the first crude experiments in telephoning been made public, when in all parts of the world there were heard the most fabulous tales of the new wonder. Distance was to be entirely annihilated, and oceans and continents traversed by the subtle current, which, at even the greatest extremes of distance, was to reproduce articulate speech.

Conversations were, with the utmost ease, to be carried on by telephone, the speakers being thousands of miles apart.

It was almost suggested that the life of the average American would be incomplete were he to omit from his daily routine the pleasure of telephoning to his friends in Japan.

Our friends in New York, over their breakfast coffee, were to have from London oral cognizance of what was most thoroughly "English," on that same afternoon, echoed—at the turn of a switch—by the midnight songs of the seals at the Golden Gate.

The precise advantages of these results were not stated, but in the usual newspaper phraseology, it required only a slight perfecting of the last and most unimportant details to accomplish all that has been stated and far exceed the expectations of the most sanguine.

It is needless to state that the results which have followed have not fulfilled these first predictions.

The wide-spread publication of imaginative successes has, in deceiving the public, robbed the laborer in this field of any laurels he might hope to obtain, by making his accomplishments appear tame in view of the marvels advertised for his art.

In contemplating this particular line of improvement the average American evidently intends to be surprised at nothing. You furnish him with a satisfactory oral communication, two hundred miles, and his comment is: "H—m; well, that's pretty good, but when are we going to talk to Australia?"

It is most fortunate that in the developments of this branch of the art itself there is enough of interest to outweigh any temporary discouragement.

It is thought that in 1877 the first successful long line results were obtained in experimental tests over telegraph lines.

During the following year many short telegraph lines were equipped with telephones as private lines, and as such were successfully used between stations five to fifty miles apart.

In 1878 or 1879, the extension of extra-territorial lines or toll lines was begun in a most unpretentious and economical manner by individuals holding licenses from the American Bell Telephone Company.

The "bean pole" and "barn top" lines were largely introduced and, in too many cases, a faulty construction resulted, retarding, in a great measure, the development of successful long-line systems.

In these days, the stability and success of the telephone as a business venture were entirely problematical, and capital was slow to seek on the highway (the avenue so recently all but abandoned by successful telegraph companies) an investment for profit in long-line telephoning.

It was soon demonstrated that telephones for exchange purposes were becoming a business necessity.

Companies were organized and capital invested in the remodeling and permanent improvement of Exchanges. Extra-territorial lines were built along highways, in all parts of the country, and developments in all branches of the business made with the most rapid strides.

To-day the well-known results of six years' work are exhibited in a showing of 1,252 exchanges, 134,847 subscribers, 539,388 exchange connections daily, 25,766 miles of poles in toll line, 35,631 miles of wire, 18,330 toll connections daily.

From a business standpoint, the first question which arises in reference to an investment in a toll line is, "Will it pay?" While the many and complex answers which we receive to this question make it impossible to apply one ruling to all cases, still, enough can be shown from results obtained, by different companies, to obtain a good general idea of such investments.

For purposes of comparison I desire to submit some deductions from information kindly furnished by a numbe of companies largely interested in the business.

The figures in the following statement are based o results obtained from plants which are designated as individual toll line systems, consisting of one or more main lines and their feeders. For instance, taking one main line connecting three to five sizable telephone exchanges, together with the branch lines or feeders running into them.

The Chicago Telephone Company shows a main line plant of No. 14 copper wire from Chicago to Elgin, Ill., 62 miles, consisting of four wires and connecting four exchanges and twelve toll stations on the direct line circuit. The cost of this plant is $12,800, or about $51 per mile of wire. The gross earnings of this main line plant for 1884 were $5,986, or $24 per year per mile of wire. Connecting with this system are four feeders, aggregating 100 miles of wire and connecting eight offices. The cost of the feeders was $8,662, or $86 per mile. The gross earnings of the feeders for 1884, were $1,363, or about $16 per mile. The expense of maintenance of this entire plant of 348 miles of wire was $821

for the year, or $2.36 per mile of wire, 4 per cent. of the cost of the plant and 11 per cent. of the gross earnings.

The average number of messages daily over the main line is 96, making the daily average per wire 24.

The Wisconsin Telephone Company reports a main line of No. 8 iron wire from Milwaukee to Oshkosh, 110 miles, connecting three exchanges. The cost was $8,369 or $76 per mile. The gross earnings of the main line plant for 1884 were $3,980 or $36 per mile of wire.

Seven feeding lines connect with this main line, aggregating 225 miles of wire and reaching 17 offices. The cost of the feeders was $9,650, or $42 per mile. The gross earnings of the feeders for 1884 were $4,287, or $19 per mile. The expense of maintenance of the entire plant of 335 miles of wire was $194 for the year, or $0.57 per mile of wire, 1¼ per cent. of the cost of plant and 2⅛ per cent. of the gross earnings. The average number of messages daily over the main line was 49.

The Telephone and Telegraph Company of Michigan reports a main line extending from Detroit to Saginaw, 100 miles long, on which No. 12 copper wire is used. The original cost of the line was $5,000.

Two offices are connected on the main line, being the two terminals. The gross earnings of the main line for the year 1884 were $2,423, or $24 per year per mile of wire. The length of the feeding lines is reported as 90 miles, connecting 7 additional offices.

The original cost of the feeders was $5,445, or $60 per mile.

The gross income of the feeders for the year 1884 was $990, or $11 per mile of wire. The expense of maintenance of this 190 miles of wire for the year 1884 was $300, or $1.60 per mile of wire—3 per cent. of the cost of the plant and 8 per cent. of the gross earnings. The average number of messages daily transmitted over the main line is reported as 40.

It will be noted on the above that the original cost of the construction of the 100 miles of copper wire is exceedingly low, averaging only $50 per mile.

The N. Y. & N. J. Co. report systems of toll lines averaging in cost about $113 per wire; reporting the expense of maintenance at about $3 per annum per mile of wire.

The Bell Telephone Company of Buffalo reports a main line running from Buffalo to Rochester, being 85 miles of No. 9 iron wire, connecting 7 offices. This line cost $8,500, or $100 per mile. The gross earnings for the year 1884 were $2,400, or $28 per mile. The expense of maintenance is reported at $100, or $1.18 per mile, and the average number of messages daily over the line is 33.

It was supposed that the preferable plan for investment was to connect the large business centres together by main lines and then to extend feeding lines connecting tributary towns and villages with this system. This plan has certainly proved to be correct.

The toll business is gathered from the smaller tributary towns, and is more profitable in messages sent to the large exchange centres.

Thus the representative systems to-day are found to be in radial lines centring in some local metropolis and in main trunk lines connecting two or more such centres, together with their branch lines or feeders.

The limit of distance in practical and profitable working, is about 100 miles, although a considerable business is done over 150 to 200 miles of wire.

The exchanges which show the greatest amount of average profit in toll business are those ranging from 100 to 500 subscribers.

Cities of from 10,000 to 50,000 population appear to hold that peculiar business relationship with the surrounding country which is most essential to toll telephone business.

Exchanges of 100 subscribers show monthly reports of $300 in toll business, others of 1,500 subscribers report about $1,200 to $1,500.

Sustaining its proportion, the latter exchange should report $4,500 instead of $1,500.

The question of earnings, however, depends so much upon local influences that it is quite impossible to produce any general average representative of the results in all parts of the country.

The question of rates has not been treated uniformly by all companies. Many have endeavored to meet the telegraph rate in all cases, and to cut it on short lines. Others charge higher rates in almost all cases. A "square" rate based on county lines has prevailed to some extent, while a "direct distance rate" has also been found quite satisfactory. A minimum rate of 25 cents, and a maximum of 50 cents, prevail very generally. The rate is based on the use of a wire for five minutes or less. It is shown that the average length of time of a toll message, after the parties get together, is two minutes, the average time spent in calling and starting messages is much longer than this.

The number of messages per day depends entirely upon the number and size of the exchanges and towns connected. The exchanges of 100 subscribers each will seldom show a daily average of over 20 messages per wire on the toll line connecting them.

In practice, therefore, twenty messages a day between two offices may be said to cover the average busy line. At 25 cents each, less 20 per cent. for extra-territorial and operating expenses (a low estimate), the wire will earn $4 per day. Computing the cost of construction at $75 per mile, it can easily be figured how much of a line it is profitable to build, with an earning capacity of $2 a day for each exchange connected.

The conclusions reached will depend largely upon the rate of interest at which we wish to invest our money.

A number of telephone companies have tried in different forms, what has been known as the toll ticket plan. Coupon tickets, redeemable in toll line service, have been issued to parties interested in the extension of lines. If the citizens in a town or village are desirous of securing telephonic communication with a neighboring county, town or metropolis, they are asked to purchase toll line tickets to the amount of say $50 per mile for the line to be built, as evidence supporting their statements that the line will pay.

If the sum so advanced is applied to the construction of the line it is quite likely to pay well, especially after the first year.

It is proven beyond a doubt, that toll lines on which an issue of tickets is made are used very much more than those built without it.

Subscribers holding toll tickets show an interest in the toll lines and a desire to use them that has not been reached in any other way. The toll ticket is certainly seductive, and as a means of getting people into the habit of using toll lines cannot be excelled.

It may also be added that the dead-head toll ticket has a potent charm for the Legislature, the county road-master, the underground-wire alderman, the old woman whose cow is killed by lightning on the telephone wire and sundry other personages. Considered from all its points the toll ticket is, evidently, quite a good thing.

Soon after the construction of the first long lines there came reports of mysterious noises heard in the telephone. At one end of the country statements were made that the croaking of bullfrogs and the singing of birds made serious disturbances, while in another locality it was held that the interferences were caused by the sighing and moaning of the wind. After a while the term "frying-pan noises" was adapted to the general disturbances, and, later still, they were resolved under the head of induction. By whatever name these disturbances may be called they still remain the most perplexing and annoying features of long-lined work. In dry and cold weather, particularly during the winter months, long lines are practically free from disturbances. With the advent of warm weather, however, comes a series of buzzing, crackling, frying and other noises on the lines which prove a most serious interruption. It is almost impossible to obtain any definite information in regard to these troubles and their remedies.

It has been remarked that the laws of inductive disturbances are not similar in any two States. Some companies report a serious loss in business on account of noisy wires, while others fail to notice any such troubles. The introduction of resistance into the circuit has been found beneficial in suppressing inductive disturbances, but has, in a corresponding degree, weakened the telephonic effect.

Leaky lines have been found less noisy than those well insulated.

Variations in temperature, cloud effects, sudden changes of barometer, velocity of wind, direction of line wire and many other things have been mentioned as causes affecting noises on long lines.

Up to the present time it has appeared quite as impossible to remedy the bad effects as to control the causes which we hold accountable for them. The most natural and general remedies which suggest themselves are a louder transmitter and a less sensitive receiver—a receiver which will be affected only by the particular current governed by the transmitter worked in conjunction with it. As members of a large and growing family of licensees, we will endeavor to have faith in the efforts of our indulgent parent, the American Bell Telephone Company, to supply this existing want.

Another surprise in long-line work was the discovery that when two wires were strung on one line of poles the inductive effect of one to the other was, in many cases, so great as to make it impossible to talk on both wires at one time. The effects of this "cross talk" have varied exceedingly in different localities. Some companies report that they have educated their subscribers so they do not mind it. Others find it a serious difficulty. As yet no satisfactory remedy for the trouble has been found. It is thought, however, that a minimum effect in cross talk is obtained where one line is attached to glasses, well insulated, and the other attached to a bare pin or bracket. Opinions differ on this result. It has been proven, beyond dispute, that the best wire for long lines is that of the smallest diameter and of the lowest resistance.

Soon after this conclusion was reached the hard-drawn copper wire was perfected and introduced largely. The best results which have been obtained in long-distance telephoning have been over this hard-drawn copper wire. It is fortunate that at this time the price of copper wire has been largely reduced, making it possible to use the wire extensively. In the Northwestern States the complete cost of a line of No. 12 (Brown & Sharpe) copper wire, with 30 poles to the mile complete, is about $75 per mile.

In the same territory such a line, free from extraneous noise, and from all office resistance (annunciator coils, etc.), can be worked with excellent results a distance of 250 to 300 miles. It is both wise and profitable, in the construction of a copper line, to employ experienced and careful linemen: to avoid straining or twisting the wire; to solder all connections, and to avoid the use of pliers, eccentrics or other tools in pulling up or tying. In long-line work it is also found advantageous to keep the wire clear of annunciator coils, ring-off drops or electro magnets of any kind. Such coils have a retarding effect which is most disastrous.

In the practical operation of long lines, in connection with telephone exchanges, one of the most important features is the attention and co-operation of an intelligent operator. This is particularly necessary in making prompt connections and disconnections, and also, in what is called "getting the parties together."

Time is a most valuable ingredient in toll line work, and much valuable time on the line may be lost by an inattentive operator.

It has fallen to the lot of the toll line operators to educate the public in the use of long lines, and it is only after very many admonitions to "stand closer to the instrument," "talk a little louder" and "go ahead" that the present proficiency (?) has been reached.

Happily the good work is still going on, and the pupil is keeping pace with the improvement in his means of communication.

In that bright future, to which we look forward (the days of the loud transmitter, and the receiving telephone which attends strictly to its own business), we may also see the patient subscriber waiting his turn on the wire, saying "please" to the operator and settling his toll bills without a murmur.

No better evidence of the newness of the toll line business can be furnished than reference to the widely differing results obtained in various parts of our own country. It cannot be said that the experimental stage has yet been passed. No settled policy has been developed. It has yet to be shown upon what basis very long lines can be operated at a profit. This is the problem yet to be solved.

It is due to the most commendable enterprise of the licensees, in this country, that the present stage in the development of long lines has been reached, and the steady application of this enterprise will ultimately accomplish the desired end. The inventive genius of the world is straining every nerve to produce the "far speaker;" the network of lines and wires doubles and trebles in extent each year; cities, towns, villages and hamlets are awakening to the fact that inter-communication is indispensable. No such pressure was ever before brought to bear on any one department of business. For the solution of this problem the public looks to the American Bell Telephone Company, and its licensees in the United States.

It is with much confidence that I venture the opinion that the expectation will be satisfactory and speedily realized.

This paper elicited the experience of several members in long-distance work, and the discussion was participated in by Messrs. Sargent, Lockwood, Wilson, McClure, Sise, Fowler, Eastabrook, Hall, Storke, Fay, Stone, Cowles, Callender, Uline, Reilly, Keller, Metzger, R. M. Bailey, going over the various points raised in the above paper. Those actively engaged in telephoning stated facts of an encouraging character as to the extent to which they were carrying long-distance work. Mr. Callender described some successful experiments carried on at his company's works at Newark with electric light and telephone wires in the same bitite conduit. Mr. Hall invited the members to try the new long-distance transmitter in Room 4, exhibited by the American Bell Company, and used by the American Telephone Company in its long-distance operations with excellent results. It came out in the discussion that two new troubles had to be encountered—the induction from railroad "induction telegraphs" whenever they are in use, and, as in Baltimore, the induction from the conductors of the electric railway. It also was stated that difficulty was experienced from the induction of two or more metallic circuits on one pole line.

Mr. B. E. Sunny, of the Chicago Telephone Company, then read a very interesting and elaborate paper on "Exchange Statistics." One table gave the following figures as to the extent of patronage of the telephone in the leading cities of the country, the ratio being one telephone to so many of the inhabitants.

	Population, Census 1880.	Ratio.	Subs., 1885.	Increase over 1884.
Baltimore	332,313	204	1,630	180
Boston	362,535	214	1,696	....
Brooklyn	566,663	241	2,354	508
Buffalo	155,134	101	1,533	113
Chicago	503,185	138	3,630	404
Cincinnati	255,130	101	2,535	297
Cleveland	160,146	98	1,620	3
New York " Law }	1,206,209	229	5,252	444
Philadelphia	847,170	366	2,310	111
Pittsburgh	247,765	148	1,688	....
St. Louis	350,518	229	1,528	156
Albany	90,758	77	1,158	16
Detroit	116,340	59	1,956	256
Louisville	135,000	106	1,271	....
Lowell	59,485	74	800	....
Milwaukee	115,587	84	1,375	212
Paterson	51,031	78	651	100
Providence	104,857	48	2,162	270
Rochester	89,366	110	808	82
Worcester	58,295	75	777	....
Washington	144,293	127	1,138	366
Jersey City	120,722	187	648	247
Denver	35,629	....	751	28

Another interesting table was that showing the average number of daily connections. It appeared that New York has increased 15,000 a day (the number being now 36,153), and Brooklyn has increased 5,000, the number being now double that of last year. Cleveland has increased 6,000, notwithstanding the increase of only three subscribers. Chicago has increased 4,000 above 27,101 in 1884. On the other hand, Philadelphia, with an increase of 111 subscribers, falls off 4,000, and Albany and Denver show a slight falling off. The number of average daily calls per subscriber shows as follows: Albany, 7; Baltimore, 7; Boston, 6; Brooklyn, 4.5; Buffalo, 3.9; Chicago, 8.6; Cincinnati, ; Cleveland, 10: Denver, 6; Detroit, 10.6; Milwaukee, 3.2; New York, 7; Philadelphia, 6.5; Pittsburgh, 6.8; Providence, 5.2; St. Louis, 6; Washington, 3.5. The Detroit subscriber is evidently bent on getting the worth of his money.

The table of connections lost or delayed gave Milwaukee a percentage of 20, this remarkable figure being explained by the repeated calls in the morning hours for railroad offices that are busy. Washington is 19 per cent., Pittsburgh and Detroit each 10. New York and Chicago are only 5¼ and 8⅞ per cent. respectively. In Chicago the subscriber calls but once for the party, and if he be busy, the connection is made when he is disengaged, if not for three hours. It is found that this is highly satisfactory to the subscriber, and relieves the operator from answering calls for the same party several times. New York, it appears, follows a like course.

As to connections per operator, the offices working on the multiple system, eight in number, average 387 connections daily per operator. The remaining nine reported, not multiple, average 268 connections per operator. Albany, Cincinnati, and Denver are making fewer connections per operator than a year ago.

The cost per 100 connections, so far as related to exchange pay-roll, was in Detroit, .21; Providence, .28; Baltimore, .25; Albany, .30; Cleveland, .31; Boston, .38; Brooklyn, .41; St. Louis, .44; Milwaukee, .46; Chicago, .48; Pittsburgh, .51; Washington, 51; Denver, .55; Buffalo, .64; New York, .66. Thus Buffalo pays 4 cents a hundred more than a year ago. New York shows no change, while the others have been cut down materially.

Figures were furnished in the paper showing increased rapidity in making connections. The number of trunk lines is also exhibited as on the rapid increase. Since last year nine offices have increased from 1,393 to 1,712, or 23 per cent. A tabular statement of the capacity of the cord and plug switches shows the cord board to be rapidly supplanting the plug. Fifteen exchanges, representing 31,945 subscribers, are classified as having 491 instrument troubles daily, or one case on each every 65 days, so that on an average each telephone is used 780 times before becoming defective. With smaller exchanges, however, the percentage is greater. One inference drawn is that, considering the maintenance account, exchanges were not justified in figuring residence and country rates low, since the apparatus therefore did not get out of order less frequently than that for the business portion of the city.

The paper closed as follows: "I want to remind you of the very appropriate remarks concerning insulation, and conductivity in the last report of the Statistical Committee. I think that we are rapidly disabusing our minds of the false theory that bad insulation and poor conductivity do not impair the working of the telephone; and I want to suggest a more universal adoption of the galvanometer for the purpose of discovering defects in lines and instruments, that are alike hurtful to city and toll line service. In attempting this piece of missionary work, I am backed by some cold facts, and you will pardon me if they are not from the several exchanges, but from Chicago alone. We have been measuring every wire in all of our offices

and have about half of them done. We found 112 defective, and removed 100, 111 ohms resistance, or an equivalent to the resistance of 8,128 miles of No. 12 iron wire. The majority of cases of trouble were in line connections, probably made in winter, the repairer doing his work carelessly and hurriedly to get out of the cold. Many cases were at the ground connection, or in the instruments. We aim to solder all connections, and notwithstanding our strict enforcement of the rule we cannot avoid these troubles, nor can any exchange. Some of the lines of the 112 had been repeatedly complained of by the subscriber, and as many times tested the old-fashioned way and found O. K. The galvanometer quickly discovered the trouble for us. As all exchanges must be afflicted in this respect, as we are, we are glad if our experiments can help them."

An interesting and instructive paper on "Legislation" was read by the Treasurer, H. L. Storke, in which he reviewed late legislative proceedings with reference to telephonic interests throughout the country, in an able and comprehensive manner. The facts embraced have appeared in THE ELECTRICAL WORLD from time to time.

Mr. Lockwood, in commenting upon the paper, spoke with great effect on the necessity of a concert of action on the part of the Association to defend itself from antagonistic and mischievous legislation. He also spoke of the necessity of educating the public to the idea that the service given was more than was actually warranted by the cost of operation and maintenance and of building up a great system, embracing all the improvements and adequate to the needs of the day, so that the cry of "monopoly and robbery" will no longer be heard.

Mr. Durant advised members, when they had obnoxious legislation to meet, to oppose it bitterly as it stood, and not seek to compromise or modify.

President Fay also referred to the efforts of the enemies of telephone associations to influence legislation. They claimed that it was generally the gratuitous work of persons who have axes to grind, who expect to be bought off or are hopeful of gaining popularity. They are persons who resort to underhanded measures, and fear to meet open and fair argument. He hoped that the members of the Association resident in the several States would keep the Secretary fully informed of legislative proceedings for mutual profit and protection, and the Secretary would circulate such information among the members from time to time. The Association should oppose a united front and seek to protect their interests by the most efficient representation at the State capitals.

A vote of thanks was tendered Treasurer Storke for his carefully prepared and instructive paper.

Mr. W. H. Eckert, of New York, gave an interesting account of the operation of the underground system in New York.

The meeting then adjourned to 3 P. M.

As the afternoon session approached, the interest of the members rose in expectation of the contents of the papers about to be read. Those which had been announced were of a nature which came directly within the province of each one present, and when the meeting was called to order every member was in his seat.

The first paper was from Mr. W. R. Patterson, of the Western Electric Company, on "The Underground Problem," the gist of which is as follows:

MR. PATTERSON'S PAPER.

In spite of all alleged demonstrations to the contrary, and in spite of the assumed power of a City Council to regulate not only the laws of trade, but the laws of nature, it is a fact that men who are practically interested in the matter still see difficulties in the way of underground wires for general use. These difficulties may be divided into three general classes, scientific, mechanical and financial. One man told us there are no scientific difficulties in the way of underground telephony, and another tells us they are insuperable, and both are right. If it is only a question of talking across the street, there are none; if it is a question of talking across the ocean or a continent, they are insuperable with our present knowledge. It would be very rash to claim they must always be so, but it will take something besides an act of the Legislature or an ordinance of the City Council to overcome them. The scientific obstacles in the way of unlimited and universal underground telegraphy and telephony are retardation, escape and induction. These difficulties are common to underground wires for all uses, but are especially troublesome in telephone work. It is the subject which has received least attention from inventors of systems, and it seems entirely beyond the comprehension of most people that an underground wire say from the Harlem River to Jersey City or South Brooklyn may, in some respects, be an exact counterpart of an aërial line from New York to Buffalo or Pittsburgh.

The causes of retardation are well understood, and its laws well defined, both by mathematical reasoning and by actual experiments upon long submarine cables. Every text-book of electricity gives formulas for the speed of working cables, and in connection therewith the distance which a cable of any specification can be worked at a given speed, which is the telephonic way of stating the case. If a telegraph cable will not work at the rate of forty words per minute it may be perfectly feasible to work it at a speed of twenty, and it is only a question of braiding a duplicate cable if the business requires forty to be sent. But the law of acoustics fix the number of vibrations per second for any definite sound, so if a cable cannot carry the requisite number, that is an end of the matter. The distance which can be worked is shown to be a function of the resistance of the conductor and its electro-static capacity.

In the present state of metallurgical science it is not to be expected that a better conductor than copper can be found. While chemists and others, principally others, can turn out new insulating compounds almost without number, they can all be grouped into a few genuine classes, the properties of which are well understood. It is not to be expected that a material of lower inductive capacity than air can be discovered, or an insulator suitable for underground use, which even approximates the low capacity of air. We cannot make up the deficiency by increasing the thickness of the insulator indefinitely, because that has comparatively small effect. Besides these theoretical objections there are practical difficulties in handling a large number of wires, which necessarily limit the size of each; and, finally, there is a limit to the last which precludes the use of metal and insulators in unlimited quantities per foot. The other factor, the resistance of a telephone circuit, has been generally, until of late, considered to be of little importance. Every one has talked through a wet string, or through a man's body, or in some such way, which shows that the current sent by the transmitter will overcome resistances which would be a practical break in a telegraphic battery circuit. But we have seen that the resistance of the circuit is one of the elements which determine the distance which can be worked at a given speed. So it becomes a matter of the utmost importance that not only the resistance of the cable conductor shall be low, but that all other parts of the circuit, especially ground connections and splices, shall be of low resistance. With all these well-defined and unchallenged limitations, there can be but one result—the length of wire which can be successfully worked must be limited.

If we had to provide for but one city, the limitation might not be troublesome; but there is a demand for communication between distant places. While the underground wires may work perfectly in our city, when a long aërial line is attached the conditions are entirely changed, and it will not improve matters any if there is an extensive underground circuit at the distant end.

This question of the possibly required aggregate underground mileage in a thickly-settled country is the hardest part of the problem. This year it is only for cities of over 500,000 inhabitants, but how long will it be before cities of 100,000 inhabitants will follow suit; and villages of 1,000, seeing in underground wires a feature of metropolitanism that will cost them nothing, will before many years be asking for commissions and enactments.

The second difficulty we have referred to is the escape of the current. This escape is to be considered in three aspects—first, as so much direct loss; second, in its effects upon other conductors; and third, in its effects upon the medium through which it passes. In both the first two effects aërial lines share equally with underground, and there is nothing in either to limit or destroy the efficiency of underground wires. But in the third aspect—the effect of the escaping current upon the medium through which it passes—underground wires are peculiarly liable to injury and destruction. In case of an aërial line, whatever current escapes and does not get upon other wires goes harmlessly to ground. In underground wires, wherever it goes, it first passes through the insulators. Electricity is a great promoter of chemical changes, and though the current passing through the insulator may be very small, almost inappreciable with ordinary instruments, yet when it is continued for an indefinite length of time, the aggregate effect may be serious. For this reason a high initial insulation is the best guarantee of durability, provided only the material exposed to the action of the elements has stood the test of time. The specific insulating quality of any material used for an insulator is so high that unless this result is obtained it is conclusive evidence of some fault in manufacture, which may become serious. But the difficulties to be overcome in securing high insulation are of more practical interest to the manufacturer. In the matter of induction we have nothing essentially different from the troubles experienced on aërial lines. While the proximity of the conductors in cables would seem to offer the best conditions for the establishment of induced currents, the proximity of the earth to a great extent prevents their becoming troublesome. Metallic shields, wholly or partly surrounding the conductors, individually or in groups, are a well-known device for preventing induction, and the use of a symmetrically-placed return wire is an absolute cure for the trouble. But the remedy may be worse than the disease if too much is taken to cure a slight case, since the return wires increase the resistance of the circuit, and other things being equal, the nearer the ground the higher the inductive capacity, and induction is only exchanged for retardation. In case of very long cable lines, induction is a factor not to be neglected. We know only two ways of removing it, namely, by increasing the length of the wire and by increasing the inductive capacity. This is the problem, then, to be solved. Construct an underground system, the ultimate extent of which is an unknown quantity, so that neither induction nor retardation will render it useless.

After the mechanical work connected with the manufacture of the wire and its insulation is properly performed, there still remain mechanical difficulties to be overcome in laying the wires so as to secure the utmost possible durability, or even to insure any service at all. None of these mechanical obstacles are insuperable or offer as much difficulty as the electrical requirements which we have discussed; yet they are not to be neglected, as any want of forethought or care in handling and protecting the wires may destroy the best electrical work. Most of the mechanical difficulties experienced are of such varying character that only a careful study of the conditions existing in each place can overcome them. In general, the system which requires the least possible work to be performed in the street will escape much of the danger of injury. The number of possible things that happen and the grand aggregate of all the little things that are done to the detriment of the work by an inquisitive crowd, the weather and the total depravity of inanimate matter, would seem incredible to any one who had not experienced them. What is the best method of protecting underground wires from external injury is as easy to decide as the best way of protecting human life from loss by accident or violence. The ideal protection for underground wires would be a dry, light, roomy and well-ventilated subway. Such a one can be constructed with the utmost facility on paper. It would be found in a city built to order under one comprehensive plan, and, before it is lined in, completely equipped for a hundred thousand or a million inhabitants, as the case might be, with no subsequent additions allowed. But we have to take cities as we find them, which, like Topsy, "have growed." With the existing systems are more generally lack of systems of sewers, water, steam and gas pipes, street railways, and the general plan of streets and alleys. Such a subway is impractical. We are reduced to two general methods of protection; one is to lay the wires or cables and fill in around them with a mass of protecting material, as asphalt or cement; the other is to draw the cables into a previously-constructed conduit. Neither method is free from disadvantages when compared with the ideal sub-way, but the conduit plan seems to have less than the other, and to offer some advantages which are a fair return for the additional expense. In the choice of a method of protection, all the local conditions are to be considered, and a plan which is successful in one place may be a failure in another.

The third class of objections we see are financial. It needs no argument to show that it will cost a great deal more to put all the wires of an exchange under-ground than to carry them on poles and house tops. Saying nothing about its theoretical advantages, air is by far the cheapest insulator known. The insuperable part of the financial difficulty is the proposed throwing away of a full equipment of lines which are in working condition, and replacing them by an entirely new and more expensive system. To even overcome the difficulty due to the difference in cost, the exchange must be made gradually—no faster than the existing lines need renewal.

After all this enunciation of the difficulties in the way of underground service, it may seem that we have left no useful field for it. But there is an extensive field open to such service, and we wish only to look at the matter fairly and impartially, recognizing the existence of serious obstacles which cannot be dismissed with a word. We are convinced of the existence of certain limitations which have been enumerated. We are also convinced that within these limitations there are no reasonable doubts of the perfect success of underground service, as far as any electric troubles are concerned: that while no rigid system may suit all places, there are no mechanical difficulties that cannot be solved by attention to the local conditions; and, finally, that there are no financial objections which are more far-reaching than the others, or would be serious if the change were made gradually. In the proper municipal supervision of electric wires there seems to be an exact parallel with supervision over buildings. When a city reaches any considerable size the general welfare demands the establishment of fire limits within which the use of inflammable building material shall be restricted. But it has never gone to the extent of compelling owners of wooden buildings within these limits to tear down their structures and replace them with fire-proof material; neither has it forbidden the use of wood in subordinate parts of the structured or wooden polings and gates in residence streets. It does not refuse permission to prolong the life of wooden buildings by keeping them painted or by stopping leaks in the roof or replacing broken glass. When a great number of wires accumulate in a neighborhood so as to be a nuisance, it is perfectly proper for those who have the welfare of the city in charge to say that the line must not be rebuilt except under-ground. But what is the difference between ordering the demolition of a line of poles and wires and the demolition of a wooden building, because both are liable to endanger adjacent structures in case of fire, and because both are more useful than ornamental?

The idea of putting all the wires in any city under-ground throughout their whole extent is not worthy discussion—it is entirely impracticable. But in any large city the number of wires in the neighborhood of the exchange is a nuisance, both to the public and to the company, and there is no objection, scientific, mechanical or economic, to putting them under-ground for moderate distances, until they begin to diverge and scatter to reach individual subscribers. In some cases it is absolutely necessary to cable the wires in order to handle them, and there is very little difference in the working of any aërial and underground cables—none at all if they are inclosed in metal. It would be advantageous to use a special conductor for trunk lines and long extra-territorial circuits. This is about all that can be done with the present apparatus and with our present knowledge of the methods of overcoming the difficulties in the way. It is all that has been done in any place and all that any body of lawmakers can compel to be done successfully. It is doubtful if there is a large exchange in the country that would not voluntarily do as much when the present pole lines need rebuilding. The most conclusive experiments that have been made and the most extensive work that has been done thus far have not been under compulsion, but voluntary. It does not seem that at present we have sufficient data to say absolutely just what length of wire can be worked underground. We are sure that the entire system of any large city cannot be put underground, for good, scientific and financial reasons. We are sure that the entire system of any small exchange cannot, for financial reasons alone. We are sure that a general and extensive local adoption of underground wires would prevent long-distance telephoning, except perhaps from office to office. On the other hand, we are sure that when it is required to handle a large number of wires in a small space for a moderate distance, no one need fear any bad results from using underground cables. The only thing we are not sure of is the exact length of a "moderate distance." But it is probable that no trouble would be experienced in any place up to the limit of hundred-wire cables—that is, as far from any office as any hundred wires pursue the same route.

In conclusion, to state our creed, we believe in both aërial and underground wires, without bigotry or intolerance toward either, and with due recognition of a suitable and proper field for the use of each. We do not have much faith in the man who says he can put 2,392 wires in a space 2¼ × 3¼ inches; neither do we expect a lineman will be a necessary feature of every circuit of the future, to show people how they used to climb poles in the old days of telephone wires.

This was followed by a paper from President C. N. Fay called "Observations on the Use of Cables in Cities." It was practically a very forcible statement of the case for housetop cables, as opposed to pole lines everywhere or underground wires, and in the course of it Mr. Fay remarked that he had, however, not heard any telephone man before come out in favor of the housetop method. He hoped to see missionary work done in this direction, and that city fathers might be converted to the belief. He closed by calling attention to two recent events abroad. In London a court recently decided that when two opposite property owners chose to string a telephone cable across the street between their respective roofs, the vestry of the parish could not interfere to prevent them. They owned, each on his own side, the fee of the property to the middle of the street, subject to the right of way to the public, a right which was not interfered with by a cable at that height. The second case was in Paris, the city of all the world where underground telephony and telegraphy have their best development. The Minister of Posts and Telegraphs introduced into the National Assembly a bill authorizing the condemnation of the right of way over roofs in cities for telephone and telegraph purposes, because the magnificent subways in Paris were inadequate in capacity and extent to the public demand for wires, and in other cities such subways did not exist at all.

Gen. Thomas Sherwin brought the business of the afternoon to a close with a paper on "Telephone Accounts." He suggested that the accounts should be kept

under the following heads, with such local modifications of detail as might be deemed necessary:

ACCOUNTS, DR.	ACCOUNTS, CR.
Licenses.	Capital Stock.
Rights of Way.	Surplus.
Investment.	Reserve.
Construction	1. For Unearned Rentals.
(Subdivided by Exchanges, P. Line, E. T. Line).	2. " Depreciation.
Bells.	3. " Doubtful Accounts.
Merchandise.	Outstanding Toll Tickets.
Personal Property	Accounts Payable.
(Subdivided, Office Furniture and Fixtures, Tools, House, Wagons).	Earnings Account.
Accounts Receivable.	1. Exchanges.
Stocks and Bonds.	2. Tolls.
Cash.	3. Extra-territorial.
	4. Private Line.
	5. Telegraph Commissions.
	6. Messenger.
	7. Miscellaneous.

EXPENSE ACCOUNTS.

1. General Office.	11. Repairs and Maintenance.
2. Insurance.	12. Reconstruction.
3. Taxes.	13. Rebates.
4. Stationery and Printing.	14. Proportion A. B. T. Co.'s Ex. Ter. Receipts.
5. Extra-territorial.	15. Proportion A. B. T. Co.'s Ex. Telegraphs.
6. Private Line.	16. Rentals, A. B. T. Co.
7. Messenger.	17. Miscellaneous.
8. Rents.	Dividend Account.
9. Operating.	
10. Pole Rents.	

The rest of the paper was given up to a scientific enlargement of these various headings. Few members evinced any desire to go into the subject at once in the way of discussion, it being one rather for careful study at home.

The meeting adjourned at 5 P. M., the hour for Thursday being fixed at 10 A. M.

THURSDAY'S PROCEEDINGS.

The Convention met for the final session at 10:30 on Thursday morning.

Mr. J. J. Carty, of the New England Telephone Company, Boston, read an interesting paper on The Multiple System of Switchboards, giving results obtained in the Boston Exchange, where that system has its highest and latest development. The paper was discussed by several of the members.

Mr. Lockwood made a statement as to the course of the litigation against the Bell patents, and said that the company never stood in a better position as regards patents than it does to-day. He added that the Dolbear case, on appeal to the United States Supreme Court, comes up for hearing next spring.

Mr. Metzger presented an invitation to the Association to meet at Pittsburgh after St. Louis.

The Convention adjourned *sine die* at 12:10.

A large number of the gentlemen then tried the new long-distance telephone, exhibited personally by Mr. Gilliland. Conversation was carried on with New York and Boston with the most satisfactory results.

At 10 o'clock the delegates, accompanied by several of the city officials and a number of other notables, went down the bay on the steamer Philadelphia, as the guests of the local telephone company. A very fine lunch was provided on board, and after a most enjoyable sail and a right good time, the party returned to Providence about 5 o'clock.

A large additional number of electricians arrived on Friday morning to attend the annual clam dinner given by the American Electrical Works.

THE EXHIBITS.

Most of the manufacturers of goods used by telephone companies are honorary members of the association, and are invariably represented at the conventions, which they take advantage of to call attention to the improvements that have been made during the year in the apparatus they manufacture. The exhibits, therefore, are always an important feature of the conventions. To the casual observer the exhibits may have seemed simply what has been shown heretofore at other conventions by each of these diligent workers in the line of improved apparatus, but the close inspector found that although the exhibits were not very extensive, they demonstrated that during the past year excellent progress has been made by the various manufacturers.

The Western Electric Company displayed sections of underground conduits and subways, such as have been successfully used in a number of places for protecting the Patterson cables. This company also exhibited a novel village telephone system, which requires no exchange, each of probably forty subscribers having access to all the others by very ready means. The cross arm for use in this system was shown. The exhibit also included the Western electric cable clip, terminal head for spreading wires from cables, and a new galvanometer and rheostat.

The Standard Electrical Works showed their widely-used form of Magneto Call Bell for telephone circuits; also the Stevens patent telegraph key.

The American Bell Telephone Company had one of the most important exhibits in its new long-distance transmitter, by means of which communication was easily carried on between Providence, New York and Boston.

The Washburn & Moen Manufacturing Company demonstrated by their exhibit that they manufacture the highest quality of wire for telegraphic, telephonic and electrical purposes. In addition to hard drawn, they also showed some handsome samples of soft copper and iron wires of fine diameters, and some fine steel springs.

The Bridgeport Brass Company, who claim to be the pioneers in the "hard-drawn" copper wire making, were among the earliest successful workers in this growing and important branch. They have always enjoyed an enviable reputation in the production of wire of a most excellent quality, and their exhibit was a very creditable one.

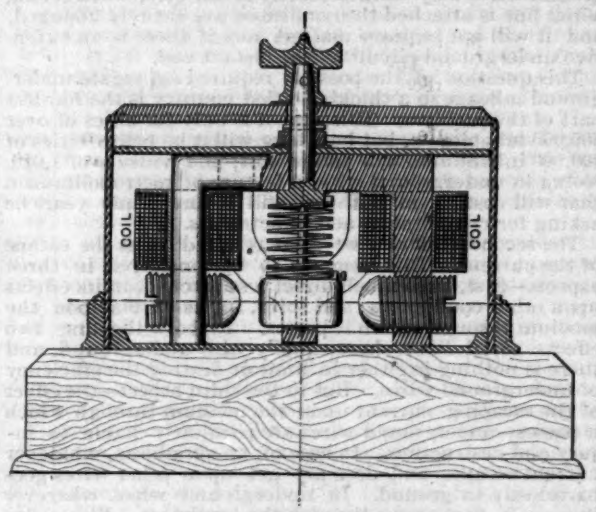
The Standard Underground Cable Company of New York and Pittsburgh exhibited numerous samples of the lead-covered Waring anti-induction cables and Waring bunched cables, of different sizes and styles, for every variety of use.

The Callender Insulating & Waterproofing Company, with their bitite insulation, which is well known, exhibited handsomely finished aërial cables, together with elaborate drawings of the underground systems which they construct, showing the groups of wire in finished cables imbedded in their peculiar insulation.

The Okonite Company, of New York, displayed samples of their different insulated wires and cables of various gauges, and an ingenious underground system of which Mr. J. J. C. Smith, the Superintendent of the Okonite Company, is the inventor. A new style of flexible armored conductor, to be used in connection with the underground system, was also shown by this company.

The Kerite exhibit included samples of the various kinds of wire and cables made by the well-known manufacturer, Mr. A. G. Day. Among the most interesting of these were the submarine cables, which have met with great success. A sample of the cable furnished for the under-water portion of the American Telegraph and Telephone Company's line between New York and Philadelphia, attracted considerable attention.

The Clark Insulated Electric Wire Company exhibited a complete collection of the great variety of rubber insulated wires and cables which they manufacture; rubber covers of all the different diameters on the standard gauges of wire, with braided jacket over all; cables for aërial wires, and lead-covered cables and wires for under-



A NEW AMMETER.—FIG. 1.

ground use. While the Clark Company have generally put their braided jacket on all wires, they show in this collection that this is not necessary, but that a dense, tough and good insulating rubber is produced by important recent improvements in their processes without braid, which, of course, serves in cable work to greater compactness. This exhibit included also line wires of iron and hard copper insulated with braid and weatherproof compounds.

The American Electrical Works, of Providence, as usual had a fine collection of samples of their extensive variety of insulated wires. For perfect finish, in all the different classes of wire, this company is acknowledged to stand unrivaled. Upon their table were arranged samples of

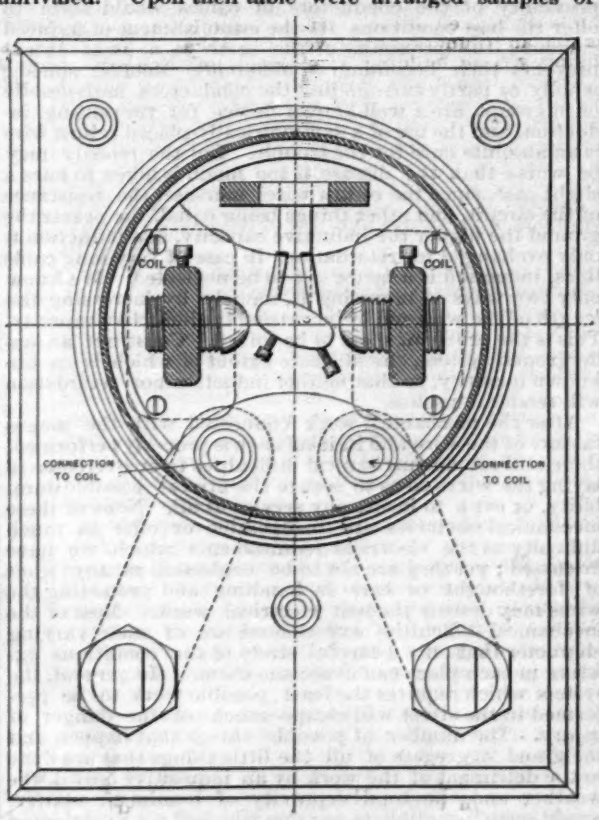


FIG. 2.

patent finished office wire, patent rubber-covered, lead-inclosed wire, "bunch" anti-induction aërial cables, switch cords, telephone cords, annunciator wire, incandescent lamp cord and fixture wire, fine magnet and other wires, also Sawyer's new clamp for holding wire to the insulator without tying. Among the collection were shown samples of very fine copper wire in exceedingly long lengths, a close inspection of which failed to show the slightest variation in size. One spool contained three-fourths of a pound of size .003 in one length; another, a five-mile piece in size .005; and another a single length of the latter size covered with silk. It is claimed by the American Electrical Works that such success in wire drawing, which is a new branch by the works, is looked upon with no small degree of envy by the older firms in New England.

The Carhart Aërial Cable Clip, as described in THE ELECTRICAL WORLD of last week, was among the exhibits most attractive to telephone men running long circuits.

Hilton's Mechanical Gongs, for fire alarm and similar purposes, were shown by the manufacturers, the Standard Time and Electric Company, of New Haven.

The Narragansett Machine Company exhibited their new screw-cutting lathe, which is capable of several quickly accomplished changes, and is especially adapted to the use of electricians.

The New England Butt Company placed for inspection several of their patent braiders and spiral winders, the neatness of design and excellent workmanship of which were much commented upon.

The Davis Individual Call System, embracing appliances for calling individually particular subscribers at will, and the maintenance of absolute secrecy, was also shown.

The Pendleton telephone responder, which was fully described and illustrated in the July 18 issue of THE ELECTRICAL WORLD, was on exhibition, and attracted much attention.

A New Ammeter.

The instrument illustrated in the accompanying cuts is an ammeter, consisting of a soft iron armature mounted on an axis between the poles of an electro-magnet. The armature is controlled by a spiral spring, the angle of torsion of which is measured on a dial by a pointer attached to a torsion head carrying one end of the spring. When no current is passing, and the torsion-head pointer is at zero, the armature rests obliquely across the line joining the poles of the magnet, as shown in Fig. 2, which is a sectional plan of the instrument; its pointer also rests at a zero mark. As soon as a current passes through the coils, the armature is dragged by the magnetic force to a position lengthwise between the poles of the magnet. The spring is now twisted by turning the torsion head by hand until the position of the armature is shown by its pointer to be the same as before. Then, since the magnetic force acting on it varies as the square of the current and is balanced by the torsion of the spring, it follows that the tension of the spring is also equivalent to the square of the current. But the tension of the spring depends upon the angle through which it is turned, and therefore the square of this angle varies as the current. The dial is therefore marked off into divisions representing successive ampères, but which divisions proceed as the square of the numbers indicated on them, and by means of the moveable pole-pieces the magnetic force is easily adjusted to suit the dial. The instrument, which is made by Messrs. Cunninghame, Woodhouse & Rawson, measures about 8 inches in length by 6 inches in width.

By reason of the strength of the spring, it is almost dead beat, and the horse-shoe magnet and armature form together a closed circuit, so that they are not appreciably affected by outside magnetic influences.

The ampères are read direct on a dial, and the instrument is adjustable by means of the movable pole-pieces, so that the same instrument may be readily set in order by one comparison with a standard instrument, and no calibration is required. Any instrument can by the like adjustment be made to register currents even double as great as those for which it was constructed.

The instruments are constructed with any required ranges from 1 to 500 ampères, but the framework of all is exactly similar, so that any instrument can be easily altered to have a different range.

By winding the magnets with very thin wire, voltmeters are constructed. These ammeters and voltmeters are also fitted with an alarm apparatus; such that when the current or the E. M. F. changes beyond a certain amount a bell rings to warn the attendant.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Aug. 20, 1885.

The New England Telephone and Telegraph Company does not seem to be in danger of losing a great number of its subscribers, owing to recent raise in rates, as many have been led to believe by the reports in some of the daily papers. On the contrary, business is reported excellent by the officers of the company, and although considerable dissatisfaction was manifested, and complaints and threats were numerous about the time rates were increased (and, in a few instances, telephones were ordered out), matters have quieted down, and almost the same tranquility of feeling prevails to-day among the subscribers as existed prior to the recent action of the company. In an interview last Tuesday, Mr. W. J. Denver, Assistant General Manager of the company, told me that he was in receipt of very encouraging reports from nearly every district in the State and from about every ward in the city; and that letters have been received by the company from several persons who had discontinued the use of telephones, requesting that the instruments be put in again.

There is a project afloat, by a company recently organized, which if successfully carried out will prove of incalculable benefit to the citizens of the city. It is an elevated railway that the new company intends building in Boston; and it is safe to say that the enterprise is a certainty, as arrangements have already been made for the erection and building of the road, and the cars have been ordered. Each car will be supplied with a Daft Motor.

In a later issue of THE ELECTRICAL WORLD fuller and more complete details of the enterprise, together with the personnel of the company referred to, will be given.

The Boston Electric Register Company will take their apparatus to St. Louis for the purpose of exhibiting it at the annual meeting of the American Street Railway Association to be held at the Southern Hotel in that city, beginning Wednesday, October 31.

The Thomson-Houston Electric Light Co. will make an exhibition test of their system of arc and incandescent lighting at the Novelties Exhibition, which commences at the Franklin Institute, in Philadelphia, Sept. 15.

At a meeting of the directors of the Orne Battery Co., recently, the resignation of Mr. A. H. Chapman was received and accepted and Mr. Chas. L. Bly was elected to fill the vacancy.

Work on the installation of the new plant of the Brush-Swan Co. at Burlington, Vt., was commenced on Wednesday of this week. Mr. George A. Mayo has charge of the

work. It is expected that the plant will be ready for lighting about Oct. 1.

The Enos Elevated Railway Co, with offices at No. 1 Pemberton square, this city, has given an order to the Massachusetts Electric Power Co. for four Daft motors, to be used in the trial of their single track elevated railroad, which will take place at an early day. The trial referred to is looked forward to by many with more than ordinary interest. The exact date has not yet been set; but, when decided upon by the promoters, will be duly published in these columns.

The Mayo Electric Manufacturing Co. is about installing an incandescent plant of 150 lights in the Cohannet Mills, Taunton, Mass. This is an enterprising step on the part of the Mayo Company, inasmuch as nearly everything (including the dynamo, lamps, and considerable other apparatus) connected with the equipment of the plant is from their factory.

Mr. A. L. Russell, who has been associated with Mr. Chas. Williams, Jr., for over 20 years, has established himself at the old stand of Mr. Williams, at 109 Court street, Boston, Mass. Mr. Russell is prepared to manufacture and furnish a fine quality of telegraph and electrical instruments, and he also makes a specialty of supplying superior instruments for electrical testing and experimental purposes. All work intrusted to his care will receive his personal attention, and it will be his endeavor to maintain the high reputation of the house.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Sept. 9, 1885.

Before this appears in print you will doubtless have seen a good many Western telephone men at the meeting of the National Telephone Exchange at Providence. Western electricians have the reputation of "turning out" in goodly numbers at occasions of this kind, and the indications are that they will sustain that reputation at the present convention.

When in Louisville, Ky., a week or two ago, I spent a considerable amount of time in going over the telephone exchange system of the Ohio Valley Telephone Company, of which the genial and well-known Capt. H. N. Gifford is general manager. It is a very complete—but it is useless to attempt to describe it in the limits of this column. An illustrated article is necessary to do it justice, and such an article will shortly appear in THE ELECTRICAL WORLD.

The case testing the validity of the new Indiana Telephone law will be filed as soon as Court convenes, and will be pressed to final decision with as little delay as possible. It is needless to say that the outcome of this suit is looked forward to with interest. The future of the telephone in Indiana may almost be said to depend upon it.

The Pan Electric people have upward of one hundred telephones in actual operation in the city of St. Louis. If the instrument tested by the writer, when lately in that city, was a fair sample, the Pan Electric Company has a very efficient instrument, and one which is likely to come into use quite largely, if it can be shown to be free from objection in the way of patent infringements.

The Ft. Wayne-Jenney Company are using forty-four 150-candle-power Stanley lamps for lighting the art galleries at the Louisville Exposition. Over one hundred Stanley lamps of various candle powers are also used in the Exposition building to light the main offices. These lamps are run from the Jenney arc machines, the Thomas cut-outs being used.

Some time ago the Chicago *Times* made the statement that "The last statement issued by the United States Electric Light Company develops the fact that during the past year over 3,100 incandescent lamps have been installed or contracted for by them." There was an error here, of course, and the *Times* took pains to correct it the next day, stating the number of lamps in the corrected notice at 53,100, which is correct. People who are aware of the large amount of work done by the the United States Company in the past year will probably be glad to see this correction of a misleading statement.

The Aurophone Company, of St. Louis, are said to be meeting with a good sale for their improved instrument.

The Gill and Segerdahl Electric Company, Chicago, find business better than ever before. They would be glad to send their circulars to those asking for them.

The Bain Electric Light Company are lighting the Chicago Exposition Building with about 125 arc lights. They have also just put a 12-light arc plant in Buncky and Milan's restaurant, Chicago.

Oppermann Brothers, of Chicago, are now doing a nice business in incandescent lamps, etc.

The Sperry Company are just starting an arc light plant at Ohio City, Ia.

The new district messenger company in Indianapolis claim about 800 subscribers to start off with—a very flattering showing. They have received satisfactory pole and wire rights, and are busy now on the required inside wiring. It would seem that they start off with everything in their favor.

The trustees of Belmont, a suburb of Indianapolis, have contracted with the Jenney Electric Company to furnish eighteen lights of 2,000 c. p. each, for $2,800 a year. This adds another to the orders which this company has received since getting under way in Indianapolis. Some of the orders, too, have come almost without solicitation, which fact ought to be a gratifying one to the Jenney company.

Chicago people read with interest the successful trials that are made in other cities of electric motors as applied to street railways. There is probably no city in the country more in need of an improvement in its street railway systems than Chicago. A successful electric railway here would be immensely popular, and would have countless friends from the start. People in Chicago have been so treated by the existing street railway corporations that an electric railway company, coming here with a show of permanency and success, would meet with a most cordial greeting. Who will give Chicago its first electric tramway?

The Western Agency of the United States Electric Lighting Company is sustaining the company's reputation for doing an extensive business, and lately received some nice one-light orders.

The Railway Telegraph Supply Company is enjoying a nice trade, and is just now shipping out large quantities of Leclanché Disque batteries.

At the time some of the almost prohibitory restrictions on electric lighting in Chicago were removed, it was predicted in this column that the business would immediately begin to show signs of rapid extension. This prediction is being realized, and the operating companies not only report some actual addition to their existing plant, but many contracts which are just on the point of being closed. "Construction companies," whose business is the installation of electric light plants, are becoming quite numerous, the latest organization being the Western Thomson-Houston Construction Company, of Chicago. Altogether, the electric light outlook in this city is promising, and the companies are feeling correspondingly encouraged. The bother of dickering with the city officials is mainly done away with, and this leaves the companies free to go ahead and secure business and get their lights burning. The companies doing business here have cause for congratulation at the very favorable outlook for them at the beginning of fall. They are all in good shape to handle it, too, and a nice business will probably be the result.

THE TELEGRAPH.

Telegraph Revenue.—The receipts on the telegraph service from April 1 to Aug. 15, 1885, amounted to £680,000 against £675,000 received from April 1 to Aug. 16, 1884.

The Telegraph Conference.—The delegates to the International conference at Berlin were given a banquet last Saturday evening by prominent members of the mercantile community of that city. The latter believe that, as a result of the conference, the great cable companies will reduce their tariffs ten per cent.

No Ten-Cent Tariff for the Western Union.—Western Union officials and directors, when asked as to the truth of the reports that a reduction in tariffs to a 10-cent basis was contemplated and would be ordered soon after the declaration of the dividend, which was declared last Tuesday, replied that the subject of a reduction had not been discussed, and there is no reason why such a reduction should be made, as the business of the company is continually improving.

The Mackay-Bennett Cable and the "Herald."—A report is current that John W. Mackay is negotiating with James Gordon Bennett for the purchase of the New York *Herald*, with the intention of putting John Russell Young at the head of its editorial staff. Mr. Mackay is interested with Mr. Bennett in the Bennett-Mackay cable, in the construction of which $8,000,000 is said to have been sunk. For Mr. Bennett's share of this enterprise Mr. Mackay is reported to hold a mortgage on the *Herald*. Mackay's wealth is much talked about in this connection. He is said to have $21,000,000 in securities locked up in his strong box—$5,000,000 in United States four per cents, $5,000,000 in rentes, $5,000,000 in consols, and $6,000,000 in State bonds and similar securities of this country, bearing five to eight per cent. interest. In addition to this is his cable investment and his interest in the Bank of Nevada. The gossip runs that he would be able to back the *Herald* with $30,000,000.

Defeat for Western Union.—The Western Union Telegraph Company applied to the courts at Little Rock, Ark., last week, for an injunction to prevent the Arkansas Telegraph Company from building a telegraph line along the right of way of the Little Rock, Mississippi River and Texas Railway between Pine Bluff and Little Rock, claiming an exclusive contract with the railroad company. The injunction has just been denied, because at the last session of the Arkansas Legislature a telegraph law was passed similar to that in effect in nearly every other State in the Union, granting telegraph companies rights of way on all railroads in the State of Arkansas. The Arkansas Telegraph Company is a branch or extension of the Baltimore & Ohio system to Little Rock, Hot Springs, and other important places in this State. Material is on the ground and work will now be pushed forward rapidly. Little Rock will probable be connected with the Baltimore & Ohio system by Sept. 20; Hot Springs soon thereafter. Arrangements have also been made for an extension to Memphis, Tenn.

THE TELEPHONE.

To a Correspondent.—No; ferrotype is not *Bell* metal, at least only in the telephonic sense.—*London Elect. Review.*

Telephone Manufactory Purchased.—The assets, property and effects of the United States Telephone Manufacturing Company were purchased in this city on the 4th inst. by Edward S. Stokes for $2,500.

The Telephone in Rome.—The Italian Minister of Public Works has consented to the formation of the "Società Romana Co-operativa dei Telefoni," which unites the two rival telephone companies hitherto existing in Rome.

The Telephone in France.—At Troyes there are 126 subscribers to the exchange, and at Saint Quentin 62. At Boulogne not much has as yet been done, but there is every probability of an extension being made at an early date.

Mr. Frank W. Jones, of the United Telephone Company of the River Plate (Limited), Buenos Ayres, and of the West Coast Telephone Company, Chili, S. A., is in Boston, and will remain there two or three weeks before returning to Valparaiso via London.

Consolidation in Brazil.—Important information has reached the Tropical American Telephone Company as to a general consolidation of telephone interests in Brazil, the effect of which will be to induce a revival and growth of business in several cities where little has hitherto been done.

Private Lines in Boston.—It is said that the demand of the New England Company for the control of the private lines in Boston will be met with a firm declination by several parties, and that the question of legality involved will be tested in the courts, by means of the concerted action of three or four of the aggrieved.

Venezuela.—The reports of the Inter-Continental Company, from Venezuela, for July, show an increased revenue over any preceding month of 1885. The leading merchants of Caraccas and Valencia are investing in the Spanish shares issued specially with the object of interesting local capital, and which pay four per cent. dividends already.

The Pan Electric.—Arguments will be heard on the 15th of this month in the U. S. Circuit Court of Maryland against the local telephone company of Baltimore, operating under the license of the Pan Electric Telephone Company, and also against the latter company itself. It is furthermore stated that a suit has been begun against the Bell Company by the Pan at Memphis.

The Newark Telephone Case.—The injunction which was recently granted by Vice-Chancellor Bird of Newark was served last week. The writ enjoins the Metropolitan Telephone & Telegraph Company, and the New York & New Jersey Telephone Company from in any way interfering with the business of the Domestic Company and compels the maintenance of communication between the Newark district and other districts. It also enjoins these companies from establishing another district telephone exchange.

Obituary Note.—Mr. Davis Vail, father of Mr. Theodore N. Vail, after having been in rather poor health and under care of a physician for more than two months, died on Thursday night, Sept. 3, at the residence of his son. Mr. Vail was nearly 74 years of age, and was born at Waterloo, Ohio. He resided for many years at Parsippany, N. J. During the past two years he has resided with his son Theodore, at No. 190 Walnut avenue, Boston, Mass. The funeral services and burial took place on Tuesday, Sept. 8, at Parsippany, N. J.

"And I Only Am Left."—The only active rival of the American Bell Telephone Company of the United States at the present time is the Pan Electric Telephone Company, organized under the laws of Tennessee, with headquarters at Memphis. Of this company, Gen. Joseph E. Johnston, of confederate fame, is President; Isham G. Harris, Vice-President; A. H. Garland, Counsel; J. H. Rogers, Electrician; Hon. Casey Young, Secretary and Treasurer. It employs what are known as the Baxter and Long patents, and other inventions. It is said that the company has exchanges in operation in various parts of the South.

The Erie Telephone Troubles.—The special meeting of the stockholders of the Erie Telegraph & Telephone Company, called to take action in regard to the purchase of the Southeastern Dakota and Arkansas telephone companies by the old syndicate, was held at Albany on Sept. 7. There were represented in person or by proxy, 28,000 shares of stock. The proceedings were brief, consisting of the remarks of President Bennett, who gave a short history of the transaction referred to above. Messrs. James W. Bennett, Ch. E. Adams and Francis Jewett were appointed a committee to fully investigate the matter, and were voted full power to act in the premises. From the remarks of the president, it seems likely that suit will soon be begun for the recovery of moneys said to have been fraudulently obtained in the purchase mentioned.

THE ELECTRIC LIGHT.

Lawrence, Mass.—The foundations of the engine and boiler rooms of the new plant of the Edison Company, at Lawrence, Mass., are nearly completed. The building will be finished early in October.

A Proper Distinction.—A magistrate has just decided that an electric light company cannot recover pay for light that it does not furnish. This is one of the points in which an electric light company differs from the Gas Trust.—*Philadelphia Ledger.*

Not English but American.—Mr. Geo. W. Carr, secretary of the Cabot Electric Light and Manufacturing Company, of 29 Wall street, this city, draws our attention to a typographical error which occurred in the patent record of last week, giving the location of the Cabot Company, to which three electric light patents were assigned by John A. Cabot, as Liverpool, instead of New York.

Electric Lighting in Italy.—The municipality of Vazallo has recently decided to illuminate the town by electricity, and the streets will be lighted with 70 Cruto incandescent lamps. The current will be furnished by two dynamos driven by a turbine, as abundant water power is at hand in the torrent Sesia. Besides the public lamps, the dynamos will supply from 90 to 100 lamps in private houses.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—B. & M., b ¼, a 1¼; Western Union, b 69¼, a 69⅜; Am. Cable, b 62, a 63.

Telephone.—Am. Bell, b 196, a 197; Erie, b 27½, a 28; Mexican, b 1, a 1¼; New England, b 30, a 31; Tropical, b 1.

Electric Light.—No new quotations.

BUSINESS NOTICES.

Anti-Magnetic Shields for Watches.—These shields, made by Giles, Brother & Co., State and Washington streets, Chicago, are an efficient protection to the works of watches from magnetism, as many testimonials in their possession show. This firm also demagnetize watches that are already affected. The Eastern Agent is W. A. Wales, 16 Maiden Lane, New York.

Hill's Hair and Whisker Dye
Colors to any natural shade of black or brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
HALE'S HONEY, the great cough cure; 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals and beautifies the skin; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.

MISCELLANEOUS NOTES.

Gaieties in Berlin.—Perhaps the most sumptuous entertainment to which the delegates of the Telegraph Conference in Berlin have hitherto been treated was a garden party given on Saturday evening in their honor by Herr Geheimrath (brother of the late Sir William) and Frau Siemens, at their residence in Charlottenburg. Their drawing-rooms and lawns, which were all beautifully illuminated with the electric light, were crowded with about 800 of the chief social and scientific celebrities of the capital, and the hospitality offered them was worthy of such a German prince of science as the brother of Sir William Siemens.

Electric Advertisements.—The electrician of th

Prince's Theatre, London, is responsible for the following method of advertising. The "plant" consists of a man, a stick, a silk pearl-shaped balloon, with an incandescent light inside, a Morse key and an accumulator. By means of the key the man can illuminate or darken the balloon at will, to the great astonisament of the people around him, whose curiosity or thirst for knowledge is excited to an extent to gratify which seems beyond the power of the man at the end of the stick. The accumulator consists of four Faure-Sellon-Volkmar cells, lighting an eight-volt "Star" lamp.

Working Up Tin Scrap.—Dr. J. H. Smith has come to the conclusion that electrolysis would be the most promising line on which to work up tin scrap. The scrap to be dealt with in his experiment had, on an average, about 5 per cent. of tin, and there was a supply of some 6 tons of such scrap per week, for which quantity the plant was arranged. It was designed to convert the tin into chloride of tin for dyers' use, the iron of the scrap being utilized as copperas. On the recommendation of Siemens & Halske, of Berlin, one of their dynamos was used. The machine in question is stated to give a current of two hundred and forty ampères, with electro-motive force of fifteen volts and an expenditure of seven horse-power. Eight baths were used, made of wood lined with rubber. They were one and one-half m. long, seventy cm. wide and one m. deep. The anodes were formed by the tin scrap, which were packed in baskets made of wood, and of a size to hold sixty to seventy kg. of the scrap. There was an arrangement for constantly agitating these baskets by raising and lowering them, thus promoting circulation of the solution and regularity of action. The cathodes were copper plates, one and one-half mm. thick and one hundred and twenty cm. long by ninety five cm. broad. There were sixteen of these, placed two in each tank, one on each side of the basket. The electrolyte used was dilute sulphuric acid—commercial acid of sixty degs. B. diluted with nine volumes of water. The tin precipitated was rather over two kg. per hour. It was very pure, easily melted when required, and in a form very suitable for solution in acid for preparation of tin salts.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS

PATENTS DATED SEPTEMBER 1, 1885.

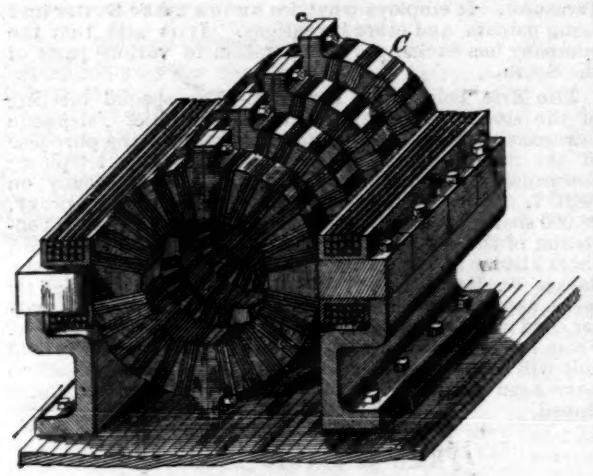
Manufacture of Incandescents; Patrick N. Mackay, San Francisco, Cal..... 325,257

The material used is a mixture of the oxide of titanium in powder and a hydrocarbon oil.

Arc and Incandescent Lighting System....1. 325,389
2. 325,390

Incandescent Lighting System; Harold P. Brown, Chicago, Ill..... 325,391

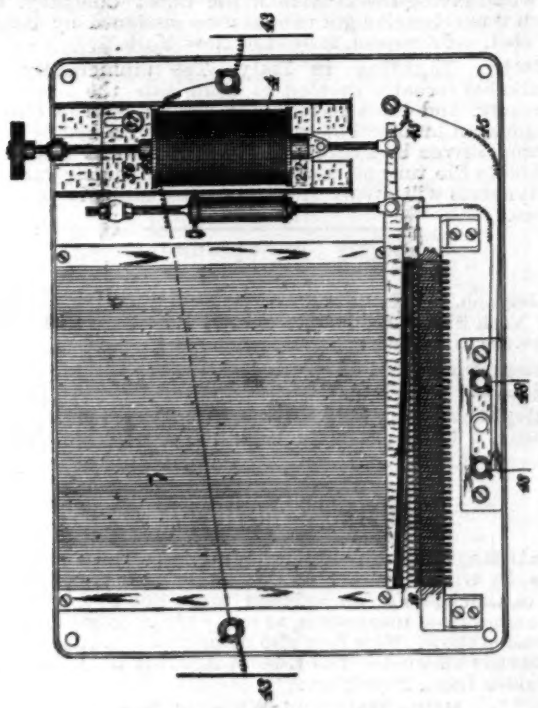
1. Consists in automatically changing the resistance of



325,619. DYNAMO ELECTRIC MACHINE.

the shunt-circuit by means of an electromotive device located in the main circuit, but which is normally short-circuited, and which is put in operation as occasion may require when a lamp in the parallel group happens to be lighted or extinguished by means of an electro motive device arranged in the local or incandescent lamp circuit in parallel like one of the lamps.

2. A single shunt-circuit having an automatically-variable resistance is employed to compensate for such of the incandescent lamps in the parallel group as may not be in use; and the invention consists in arranging the several resistance coils in parallel group, like the lamps, and in



325,576. ELECTRIC REGULATOR.

making each resistance-coil in the form of an electro-magnet to operate a switch for putting the next succeeding resistance-coil in the shunt-circuit when required. The tension of the springs connected with the armature-levers of these electro-magnets is so adjusted, by making each succeeding spring stronger than the preceding one, that the armature-levers will drop away in the reverse order, and thus cut the resistance-coils out of the shunt-circuit in the reverse order to that in which they are put in.

3. Consists in arranging all the lamps in automatically-adjustable groups, so that whatever number of lamps may happen to be in use at one time, they will always be automatically divided into such number of groups as their number will form, the groups themselves being arranged in series, and the fraction of a group, if any, being left over at the end near the return terminal of the main-wire circuit.

Electric Arc Lamp; Norman McCarty, Hoosick, N. Y., Assignor to John B. Tibbits, of same place..... 1. 325,423
2. 325,424

1. Relates to an improvement in electric arc lamps in which a shunt-magnet is employed, arranged to break the circuit through one line after it is completed through another. *E* is one fixed contact block or point for the shunt, and *F* the other block or contact. Over the block *E* is a vertical spindle *G*, carrying a contact *H*, and over the block *F* is a like spindle *I*, carrying a like contact *J*. The spindles both extend upward through a supporting-bar *K*, and so that they are held in line with their respective contact-blocks, but so that they may be moved up or down to make or break the contact.

2. The commutator for the lamp is constructed with a non-conducting surface between the bearing points of the brushes, and of less extent than the distance between the bearing points, so that one brush makes electrical contact before the other brush escapes from the non-conducting surface.

Annunciator; Henry E. Waite, New York, N. Y., Assignor to Charles F. Livermore, of same place. 325,463

The object of the invention is to construct an annunciator that is compact and powerful, and that may be fitted to a board by very little tooling, and that of the simplest nature. From one end of the core, either integral with it or fastened by any suitable means, springs the other pole or extension of the magnet *d*, and this is flattened and preferably curved, so as to fit closely over the helix, and the end may be secured thereto in any suitable manner, if desired.

Underground Electrical Conductor; David Brooks, Philadelphia, Pa..... 325,495

Consists in running clothed wires through pipes filled with an insulating liquid.

Acoustic Telephone; Joseph P. Cleaver, New York, N. Y..... 325,500

Anchorage wires are drawn tightly across the front face of the diaphragm and connected by means of short parallel wires with a metallic disc of a smaller diameter than the diaphragm and placed behind and slightly removed from the diaphragm, the said sub-diametered metallic disc forming the anchorage proper for the line wire.

Apparatus for Testing Electrical Circuits; Isaiah H. Farnham, Boston, Mass., Assignor to the American Bell Telephone Company, of same place..... 325,520

The object of the invention is to simplify and render certain those changes in the normal condition of an electrical circuit necessary in the process of testing for faults, to the end that such changes may be made by inexpert and uninitiated employés. A spring-jack of any ordinary or well-known construction is placed in the circuit, and there is provided a series of plugs, one of which, when inserted, will introduce the telephone instruments into circuit. A second plug of similar form has one side connected to ground, and a third and similar plug is of insulating material, and when inserted will open the wire. These plugs, being characteristically numbered, the testing station can obtain the desired change by instructing the way station to insert plug 1, 2 or 3, as the case may be.

Socket and Connections for Electric Light Circuits; Godfrey Hess, Williamport, Pa., Assignor of three-quarters to Henry Mitzger, of same place, and George W. Dyer, of Washington, D. C..... 325,540

By the invention the ordinary switch and connections are dispensed with and a night-lamp is produced in which one lamp can be used in full incandescence for full light and the two lamps in series for the dim light. This is accomplished by the production of a short-circuiting lamp socket, which is connected in series with a key-socket (one having a circuit-controller making and breaking the circuit) of ordinary construction. The short-circuiting lamp-socket has a circuit-controller which in one position short-circuits the lamp carried by it and in the other position throws such lamp into circuit.

Device for Lighting Gas by Electricity; Francis H. Root, Hyde Park, Ill..... 325,569

Consists of a spark-coil arranged to encircle a galvanic battery and connected in circuit therewith.

Electric Regulator; William Stanley, Jr., Pittsburg, Pa..... 325,576

The object of the invention is to provide effective and desirable means for increasing and decreasing the resistance of an electric circuit proportionately to variations in the magnetic strength of an electro-magnet.

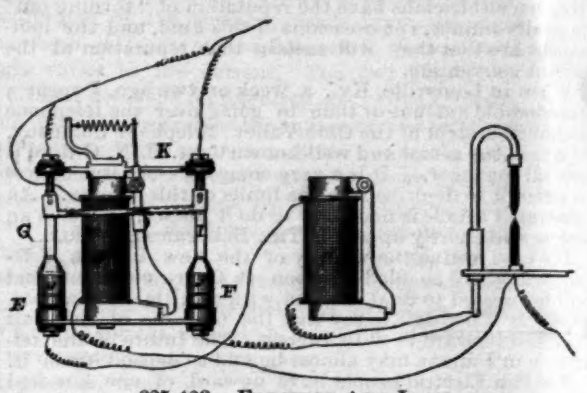
In operation an accretion of the magnetic strength of the solenoid 4, induced by an increase in the quantity of current or difference of potential in the mains 43, causes the core 22 to be attracted, and by its upward movement to elevate the connected end of the switch-lever 20, and by depressing said lever toward its free end to introduce a greater or less portion of the resistance coil 7, according to the location of the contact plate 18, with which the lever 20 then makes contact, into the shunt-circuit of which the wires 44, 45 and 48 make part.

Dynamo Electric Machine; Charles L. Fr. Mueller, Milwaukee, Wis., Assignor of one-half to Emil Schandein, of same place..... 325,619

The rings of the revolving armature, of which any number may be used, as may be desired, are fastened in any suitable manner on the driving shaft *C C C* of the machine, and are spaced thereon so as to allow of the interposition beween each pair of the same of the annular plates *C C*, a series of which form the field magnets. These plates are composed of semicircular segments, each of which is provided on its opposite ends with a flange *c*.

Insulating and Anti-Induction Tube for Electric Conductors; Frank B. Rae, Newark, N. J. 325,630

Comprises a stiff or rigid paper tube adapted to permit the electric conductor to be slipped into place after the tube is laid, and having incorporated between its inner and outer walls an anti-induction sheath, the whole forming a

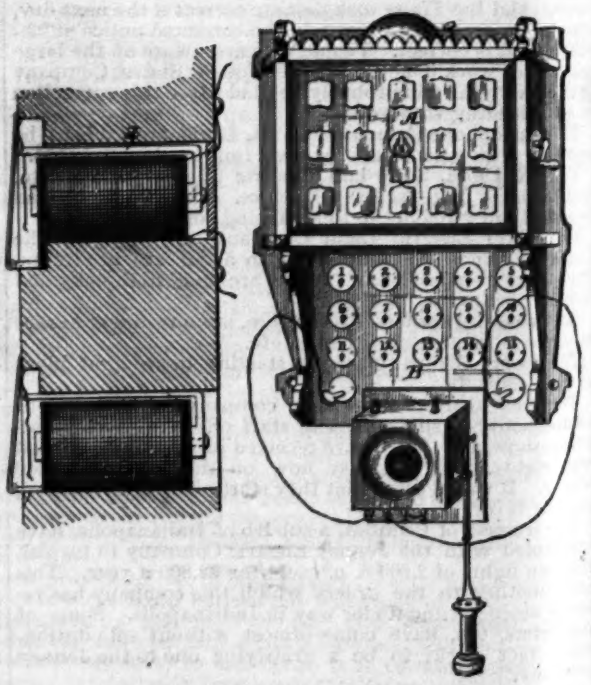


325,423. ELECTRIC ARC LAMP.

rigid envelope adapted to be transported and to be laid in any desired position without injury to the anti-induction envelope.

Electric Alarm; James J. Wood, Brooklyn, N. Y. 325,639

The bell-ringing is arranged in the direct light-circuit, and its armature is so adjusted as to be nearly balanced before the magnet, and to yield or respond only to an abnormal change in the attraction of the magnet due to an abnormal increase or decrease of current strength in the circuit, and to its armature is connected a contact-maker, which, when the armature is attracted, closes a shunt in the main circuit around the magnet, thereby causing an



325,468. ANNUNCIATOR.

alternate attraction and retraction of the armature and a sounding of the alarm so long as the abnormal condition continues without at any time breaking the light-circuit.

Electric Motor; Leonidas G. Wooley, Kalamazoo, Mich..... 325,641

Consists in a frame which forms a portion of the magnet and which has an extension upon one side for the purpose of resting under the head of the sewing machine, the object of this part of the invention being to form the frame as a portion of the magnet, and to have the head of the sewing-machine hold the magnet rigidly in position, so that it is impossible for it to move or to become displaced.

Copies of any of the Patents mentioned in this Record, can be obtained, with full specifications and drawings, from this office on application; price twenty-five cents each.